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ON WAR OF TO-DAY

BY

FRIEDRICH von BERNHARDI

GENERAL OF CAVALRY (RETIRED)

AUTHORIZED TRANSLATION

BY

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VOL. I.

PRINCIPLES AND ELEMENTS OF MODERN WAR

WITH TWENTY-ONE SKETCHES IN TEXT AND FIVE APPENDICES

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PREFACE

In the following pages I have tried to summarize as briefly as possible the results of many years of study and of preliminary labours with a view to furnishing the reader with a survey of all that concerns the conduct of modern war. Much has been written on the various branches of the science of war. But a book embracing them all and showing their relative dependency seems to be wanting; and yet it is only by distinguishing and appreciating their connection with the whole science that the true value of each branch can be properly gauged. I think that with this book I have filled a gap in military literature.

At the same time it was my object to evolve the principles and doctrines, which, in the art of war, result of necessity from modern inventions and institutions. I have gone further and laid special stress on these, because in a future war it is more a question of clearly discerning the principles which must guide our actions, than of making use of all the novelties in technics, and of competing with our enemies in numbers. I have arranged the material from these points of view.

In the first volume I shall discuss first the basis on which all doctrines of war must be founded if we wish to arrive at any practical results. Experience and foresight will be duly appreciated in regard to their relative importance; the limits will be defined between the unchanging laws of war and its changing forms; I shall further discuss the means we use in modern war, and the first principles in the conduct of war, which influence and determine its character in all essential features.

In the second volume I shall deal with the modern combat—namely, with the all-important and mutual relationship of attack and defence as influenced by modern conditions. In continuation I shall try to set forth the points which will be the ruling factors for the general conduct of war in future, which show us how to strike new paths, and which raise a commander's functions not only to an art and far above routine, but also to a task of highly moral worth.

I am well aware of the difficulties involved in such a work. The human mind is by nature one-sided and limited. It is especially difficult to grasp and represent the connection of the whole system and the relative dependency of its several parts. Generally we succeed only in producing patchwork and contributions for building up a science. We only gain a deeper insight by the clash of opposing views and by the conflict of contrary forces. The value of individual essays consists not only in *directly* contributing to the clearing up, and advancing the solution of, contentious questions, but, very much so, also, in inducing others to think over the matter and in challenging contradiction, which must then be examined on its worth.

I should like the book to be looked upon from that point of view. While endeavouring to produce something complete, I know that I am far from having attained the ideal that was in my mind. I therefore expect criticism, and am prepared to meet it. I shall be glad if it is such as to advance matters. Yet I think my views are sound and well founded, and I hope to defend them with success. I am also convinced of their being widely approved, as they have gradually ripened in the army and while I was living with the army. While serving we learn much from others and amalgamate their opinions with our own, thus forming new ideas. Consciously or unconsciously do we make use of the mental productions of others. The conflict of opinions likewise raises in us new ideas, and although it is for the individual to digest all the material that comes within his ken and then to express it comprehensively and in set forms, yet the contents of a book of this kind are more or less the ideas by which the army is consciously or unconsciously animated. Personal intercourse with prominent men will leave its mark, too, on one's own mind, however much it may have gone its own way.

Two men I must mention above all with whom I have frequently exchanged ideas since my early youth, and who have advanced me very much in my labours. They are General of Infantry (retired) von Linde, late commanding the XIth Army Corps, and afterwards President of the Supreme Military Court, and General of Infantry (retired) von Beseler, late Inspector-General of Engineers and Fortresses, one of the ablest officers of our army. Major von Colomb of the 4th Field Artillery Regiment, Major Wangemann, formerly of the 40th Field Artillery

Regiment, and especially Captain (retired) Roskoten, have kept me in touch with the technicalities of armament, and have imparted to me much valuable knowledge. To his Excellency von Nieber, formerly in command of the Air Battalion, and to Captain Niemann of the Blücher Hussars, I gratefully acknowledge the great assistance I have derived from their special knowledge. My opinions in naval matters I have repeatedly submitted for examination to a naval officer of high rank.

To all these men I wish to express my thanks, and to assure them that I am well aware of the fact that, if this work is of any value, their participation in it has enhanced its worth.

To them and to all my friends I therefore dedicate this book, which comprises a great deal of my life's mental efforts.

If they will judge of my efforts and achievements justly, if they will help to spread the seeds contained in this book and to make them grow to the benefit of the Army and the Fatherland, I shall be amply rewarded for the many years of labour, remembering Goethe's words:

> "Wer nicht die Welt in seinen Freunden sieht,
> Verdient nicht, dass die Welt von ihm urfahre."[1]
>
> GOETHE'S *Tasso.*

THE AUTHOR.

Autumn, 1911.

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[1] Means something like the following:
"Whose world is not his friends,
Does not deserve the world should hear of him."
Translator.

TRANSLATOR'S PREFACE

General v. Bernhardi has dedicated his book to his friends; mine I hope will derive as much pleasure and instruction from reading it as I derived from translating it.

K. v. DONAT.

May 4, 1912.

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ON WAR OF TO-DAY

INTRODUCTION

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When Clausewitz wrote his epoch-making work, "On War," he intended to furnish a comprehensive view of the doctrines of war, to conceive these doctrines from a philosophical point of view, to raise them to a level of general application, and, in particular, to point out everywhere the principle underlying the thing itself and the given facts.

We know that he has not carried out this plan completely; but that he had it in his mind is testified by the first chapters of his work. The rest of it he himself has marked as being merely material for a doctrine of war. But the ideas which he left behind impose upon the succeeding generations at the same time the fair task of elaborating his great design and of building up, in his spirit, a science of war on the firm foundation he has laid. The various views laid down in his book, "On War," will often have to be examined critically. They are partly ideas he culled from his own experiences of war as well as from studying military history, and which he had not time to sift and to examine on their lasting value. Much of what he said is therefore applicable only to his time, but much will retain its worth at all times, and this portion we may call the golden bars of cash reserve of his mental capital. To free this reserve from all that is accidental and dependent on the times would be a task deserving special merit.

Thus the work of this gifted man directs us everywhere from the present to the future. To give his work finality I do not think at all possible. Constantly we become aware of new forces in nature, and press them into our service, continuously obtaining thereby fresh means for conducting war. New problems must be faced, new grounds for activity are opened, and these must be considered in their mutual relationship. Theory, and what it teaches, must accommodate itself to the changed conditions under which war must be carried out. Theory is thus always subject to development, and from time to time must be cast into new moulds.

This seems to be necessary now. The same as in bygone times, superannuated and antiquated forms broke down before the French revolutionary armies, and especially before Bonaparte's ingenious mode of warfare—forms which gave the stamp to the wars of preceding periods—so, to-day, a similar change has taken place through the introduction of breech-loading arms, through the raising of national armies, and through the use of railways in war. The impetus to this development was given by Prussia, but this development was not confined to Prussia and Germany alone. The Continental States of Europe had to follow suit, if they wished to uphold their voice in the council of Europe. The consequence was a competition in the preparations for war which is unsurpassed by anything in history. Science, too, has been obsequious to this competition in a manner never experienced before. During the last decades almost all the factors determining the conduct of war have been in a constant state of fermentation. Everyone competes with the other to press into the service of war every new invention. All the leading armies zealously work to perfect their training and the rest of the preparations for war. The views and doctrines, too, on war and on the conduct of war have been developed in various directions, being influenced by the fact that to-day to this and to-morrow to that new element, affecting military matters, was attached a preponderating influence.

On the other hand, it seems to me that, in the face of the abundance of new phenomena and demands, we have not everywhere grasped clearly enough a *uniform* point of view to which all individual efforts must subordinate themselves if an harmonious whole is to be the product. Nor do we seem to have drawn precisely enough the necessary conclusions from the modern experiences of war and new inventions. Often we are still engrossed with antiquated views, and think we are able to solve new problems with their aid. Conversely, we are dominated too much by some specially striking occurrences, and attribute to them an importance which, when closely examined, does not, after all, belong to them. I think we are in want of a comprehensive doctrine of war, which on the one hand follows up the bearing of all new facts as much as possible to their utmost limits, and on the other arrives at a standpoint from which all individual military questions can be dealt with from a uniform point of view, whilst taking into consideration their relative dependency. To set up such a doctrine of war is, to my mind, the more in season, since the changes in all that concerns military matters seem to have come to an end for a while. There is no reason to suppose that we shall see in the near future a complete change of all conditions and views, though in some departments developments are sure to occur in the near future which will go beyond the standpoint of our days.

In such moments it is useful to take stock of the state of affairs, of the means available in matters military, and of the demands made upon them. Only if we are perfectly clear on these questions can we perceive what is the crux of the matter in a modern war, and where we must, therefore, put on the lever for further development. Only then can the individual also gain a clear idea of what is wanted of him in a future war, and how, in his limited sphere, he can contribute his share best to the benefit of the whole.

It has been my constant endeavour during the long time of my military career to contribute my modest share to the assimilation of the new spirit of the times and of modern warfare. The origin of this book is due to these efforts. If I have chosen for it a title reminding us of the immortal work of which General von Clausewitz is the author, I do not wish at all to make believe thereby as though I had in any way aimed as high as did this great military philosopher, or as though I had the intention, as he had, of scientifically developing a universal and exhaustive doctrine of war. I rather wished to emphasize thereby that, in contrast with Clausewitz, I am pursuing a distinctly limited practical purpose.

I am writing for to-day, and have set me the special task of depicting and critically examining the effect and importance of the present conditions which by their nature are bound to determine the character of *modern* war, and the kind of operations in the *next* war. I claim connection with the spiritual labours of the great military philosopher only in so far as I presume his views on war in their totality as being known and accepted, and in so far as, in many respects, I pick up the thread of his fundamental ideas with which, however, I have repeatedly to find fault. I think, therefore, that, in a sense, I am helping to continue his great work, and at any rate to work in his spirit. The intimate connection with General von Clausewitz's mental labours will become apparent by the fact that in my work, too, I could not refrain from developing principles of general application. It is when we have to act in the field that we have frequently to conform with them. The characteristic features of warfare all depend on them, and he who despises them will never succeed. I have, however, tried to say only what is absolutely necessary in regard to them, and have entered into theoretical discussions of what is a principle and a law in so far only as seems requisite for a doctrine of how to act in the field.

From the same point of view I have considered it indispensable to deal also with the influence of politics on the conduct of war. The deeper we penetrate into the nature of war, the more we recognize how intimately interwoven war is with the political state of affairs which directly affects the conduct of war, so that we cannot disregard this influence of politics without becoming arbitrary.

I reserve for myself the task of supplementing and further developing some matters which could be touched upon here only casually, or of perhaps rewriting and improving them as criticism may dictate. I have it in my mind to form the whole matter gradually into a doctrine of modern war, which will in a uniform manner comprehend the manifestations of our time, and which will within the compass of these particular manifestations develop the principles of acting. Whether I shall succeed in attaining this ideal may be left an open question. Is there anyone who can ever attain it?

All in all, I think that I am serving progress by my work, and that I am at the same time in harmony with the best traditions of our glorious past. It was always *timely* progress which has led us to victory, and has given us from the outset a certain amount of superiority over our adversaries. Such a superiority we must try to gain all the more in future as well, since it is only too likely that, with the present state of affairs in the world, we may be forced to fight against superior numbers, while, on the other hand, our most vital interest will be at stake. The political situation as it is to-day makes us look upon such a war even as a necessity, on which the further development of our people depends.

Germany supports to-day 65,000,000 inhabitants on an area about equal the size of France, whilst only 40,000,000 live in France. Germany's enormous population increases annually by about 1,000,000. There is no question, agriculture and industry of the home country cannot give permanently sufficient employment to such a steadily increasing mass of human beings. We therefore need to enlarge our colonial possessions so as to afford a home and work to our surplus population, unless we wish to run the risk of seeing again the strength and productive power of our rivals increased by German emigration as in former days. Partitioned as the surface of the globe is among the nations at the present time, such territorial acquisitions we can only realize at the cost of other States or in conjunction with them; and both this is only possible if we succeed, above all, in securing our power in the centre of Europe better than hitherto. With every move of our foreign policy to-day we have to face a European war against superior enemies. This sort of thing is becoming intolerable. The freedom of action of our people is thereby hampered to an extraordinary degree. Such a state of affairs is highly dangerous, not only for the peace of Europe, which, after all, is only a secondary matter for us, but, above all, is most dangerous to ourselves. It is we, whose economical, national, and political development is being obstructed and injured; it is we, whose position in the world is being threatened after we have purchased it so dearly with the blood of our best. We must therefore strive to find out by all means who is for or who is against us. On this depends not only the possibility of carrying into execution the political aims befitting the greatness and the wants of our country, but also the very existence of our people as a civilized nation.

Hand in hand with the increase of population and the growth of political power, resulting from our struggles for a united Germany, trade and industry rose to an extent hardly experienced by any nation before. (Germany's output in brain work is at the same time greater than that of any other people.)? Our prominent importance as a civilizing nation is plain to everybody after the German clans have joined hands to form one powerful State. We ourselves have become conscious of being a powerful, as well as a necessary, factor in the development of mankind. This knowledge imposes upon us the obligation of asserting our mental and moral influence as much as possible, and of paving the way everywhere in the world for German labour and German idealism. But we can only carry out successfully these supreme civilizing tasks if our humanizing efforts are accompanied and supported by increasing *political* power, as evinced by enlarged colonial possessions, extended international commerce, increased influence of Teutonic culture in all parts of the globe, and, above all, by a perfect safeguarding of our political power in Europe.

Opposed to these efforts are the most powerful States of Europe. France wants to take revenge for 1870-71, and regain its old political hegemony. Russia has a lively interest in not allowing our strength to increase any further, so that she may pursue her political plans in the Near and Far East undisturbed by Germany. Russia may also, perhaps, dream of a future supremacy in the Baltic. If at the present moment — weakened as she is by recent events in the Far East—she seems to observe pacific tendencies, she is sure to return to her policy of aggression sooner or later. And, finally, England is particularly hostile towards us, in addition to France. The phenomenal development of our commerce and industry may in time become dangerous even to the British oversea trade; the tremendous increase of our navy is felt as a constant menace on the other side of the Channel, at least should England be involved in a great war elsewhere.

We can be certain that Great Britain will most seriously resist any real extension of Germany's power, which, however, does not include the acquisition of some Central African territories.*

It is possible that in case of war we will have to face all these enemies single-handed. At least, we must be prepared for this. The Triple Alliance is purely defensive. Neither Austria nor Italy are bound by treaty to support us in all cases of war or under all circumstances. In so far as their own advantage is not touched, they take no interest in Germany's world-politics; and it must at any rate be left an open question whether their statesmen will always be far-sighted enough to make the lasting advantage of their States the pole of their policy even at the risk of a war. We are thus, in all that is essential, dependent on our own strength, and must plainly see that on the power of our defensive forces alone depends, not only our future development, but our very existence as one of the great Powers of Europe.

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* Written in September, 1911.

It is true the world is dominated to-day by the idea of war being an antiquated means of policy, unworthy of a civilized nation. The dream of eternal peace has got a hold on vast sections of the community in the Old and particularly in the New World. Whereas, formerly, in addition to Emanuel Kant, only enthusiasts and visionaries were the champions of universal brotherhood, the Governments of great and powerful States have now seized this idea as well, and are cloaking themselves with the mantle of a superior humanity. The arbitration courts, which the contracting Powers engage to obey, are meant not only to lessen the dangers of war, but to remove them altogether. This is the publicly avowed object of such politics. In reality, it is hardly caused by an ideal love of peace, but is evidently meant to serve quite different political purposes.

It is obvious that, above all, all *those* States are interested in such treaties, who wish to cover their rear so as to be able to pursue the more undisturbed and ruthlessly their advantages on other parts of the world's stage; and from this argument at once follows that such treaties, where not confined to some distinctly limited spheres of right, are only a disguise for covering other political aims, and are apt to promote just that war, perhaps, which they pretend is their intention to remove.

We Germans, therefore, must not be deceived by such official efforts to maintain the peace. Arbitration courts must evidently always consider the existing judicial and territorial rights. For a rising

State, which has not yet attained the position due to it, which is in urgent need of colonial expansion, and can only accomplish it chiefly at the cost of others, these treaties therefore augur ill at once as being apt to prevent a rearrangement of power. In the face of this widespread peace propaganda, and in opposition to it, *we* must firmly keep in view the fact that no arbitration court in the world can remove and settle any real great tension that exists and is due to a deep-seated national, economical, and political antagonism ; and that, on the other hand, it is impossible to change the partition of the earth as it now exists in our favour by diplomatic artifices. If we wish to gain the position in the world that is due to us, we must rely on our sword, renounce all weakly visions of peace, and eye the dangers surrounding us with resolute and unflinching courage.

In the situation we are in, absolutely necessitating an extension of power, and requiring us to force our claims in the face of superior enemies, I think the law of self-preservation ought to have dictated to us an increase of our defensive forces by all means available, so as to throw into the scale at the decisive moment the full strength of our 60,000,000 populace. This we have not considered necessary. Universal service, which formed the basis for our military and political greatness, is the law with us it is true, but we have not enforced it as a matter of fact for a long time, because we shirk the sacrifice we ought to make in the interest of our armed forces and of our future. The further development of our army in proportion with the growth of our population is completely paralyzed for the next five years by a law of the

Empire. We seem to have forgotten that a policy to be successful must be backed by force, and that on the other hand the physical and moral health of a nation depends on its martial spirit. We have accustomed ourselves to looking upon our armaments as a heavy burden, borne unwillingly, forgetting thereby that the army is the well from which our people constantly draws afresh strength, self-sacrificing spirit, and patriotism. In the hour of danger we shall have to pay in blood for what we have neglected in peace, from want of willingness to make some sacrifice.

But we have to reckon with all these circumstances as given factors. The enmities surrounding us cannot be exorcised by diplomacy. Armaments, under modern conditions, cannot be improvised at will the moment they are wanted. It seems impossible to get ahead of our rivals in matters technical. So much more, therefore, must we take care of maintaining spiritual superiority in case of war, and of making good, by will-power on the one hand, and by the skill of our operations on the other, the superiority in material and personnel possessed by our likely adversaries.

The more we study the nature of the art of war, and the more fully the army is alive to what is essential in war in general, and in the conduct of modern war in particular, the more uniformly and to the point will every portion of our army co-operate in war, and the greater will be the mental and moral superiority we shall gain over our enemies.

The essays which here follow are meant in this sense to clarify and advance matters, and to cause others to think for themselves with a critical mind.

The task of the future can only be solved if all the mental capacities of the army co-operate in enlarging and deepening the doctrines of war, and making them the common property of everybody. We must never be satisfied with what we have achieved, but must be ever bent on examining afresh the doctrines of war by unremitting mental labours, and on further developing them in response to modified conditions, without departing from the path prescribed by unalterable laws; we must endeavour by correct estimations of what is coming to anticipate the outward development of things, and thus gain a start which our enemies will be unable to retrieve on the field of battle.

> "Lass den Anfang mit dem Ende
> Sich in eins zusammenziehen;
> Schneller als die Gegenstände
> Selber dich vorüberfliehen."
>
> GOETHE.*

This is what is required of us in the future. If we succeed therein, only then may we hope to be always well abreast of our time and its martial requirements.

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* This may be rendered somewhat like this:

"Let the end with the beginning
Join in one to form one ring;
Let yourself be moving quicker
Than the objects you see flitter."

TRANSLATOR.

I

THE BASIS OF THE THEORY

CHAPTER I

THE SECRET OF MODERN WAR

Multiformity of modern war, p. 14—Changed conditions of Central European war, p. 15—Moltke's importance concerning the discernment of future wars, p. 16—On what this discernment rests, p. 18—Indecisive and decisive wars, p. 19—Periods of superiority and decline in the Prussian Army, p. 20—Possibility of future superiority, p. 22—The superior principle of acting, p. 24—Superiority in what is decisive for the conduct of war, p. 25—Superiority in a future war, p. 26—Constancy, experience, and speculations, p. 27.

The nature of modern war is not a simple notion. It is subject to numerous modifications according to the character of the contending parties and of the various theatres of war. It is altogether different whether we are fighting in the Balkans or in Manchuria, whether Russians are fighting against Japanese, or Spaniards against Riff-Kabyles. The fundamental principles of war certainly remain the same, wherever it is waged; but special conditions cause in each case special methods of employment of the fighting forces, and these latter, again, will differ frequently.

If we are moving with forces of some size in a desolate, roadless, or mountainous country, we are obliged to adopt proceedings altogether different from those obtaining in a vast, slightly undulating plain, where railways and a well-built and extensive network of roads abound. Again, things will be otherwise if we carry on war with small armies in a country little cultivated, like the English in South Africa, or are operating with armies of the size as those of the Great European Military Powers in a richly cultivated and densely populated theatre of war.

It is this latter sort of war which we are concerned with most, for it is such a war we ourselves will have to wage, and this kind of war it is that stares us in the face like an inscrutable sphinx. There seems to be no doubt that, in a war like this, forces will assert themselves which we have no experience to gauge, and the effect of which we can scarcely properly realize. Whole nations are called up to take the field against each other. They are going to fight with arms of patterns, perfect as never before. The proportionate numbers of infantry, artillery, and cavalry are quite different from those of former times. Means of transport will be used to an extent and of a perfect type as we have never seen used before by any army in the field. Every technical means is pressed into the service to facilitate intercourse. Even the air must be conquered; dirigible balloons and flying machines will form quite a new feature in the conduct of war. The question also arises how modern permanent fortification will affect the combat. It seems that all trade and industry must stop, when every capable youth is called away from work. It has been said that the effect of modern arms is such as to incapacitate the weakened nervous system of the highly civilized nations of Mid-Europe to resist this effect for any length of time. And lastly, we must also weigh the influence of naval warfare on what is going on on land, and what its effect will be on the whole campaign. The course of events at sea may mean starvation for the population. In short, a future war will reveal to us a series of seemingly incalculable forces. One might almost come to think that success in war will be more or less a matter of chance, and could in no way be influenced by foresight or to any extent be forecast; that the will of the commander was, so to say, switched off in the incontrollable game of these tremendous forces; that we can only call up these forces, and then leave it to the elementary potentialities to produce whatever they choose from this turmoil.

I think it is not so, after all. If we closely examine the possible effect of all the new phenomena which in a future war must assert themselves, and then test them in their relation to the general laws of warfare, we must succeed in getting a general idea of the nature of modern war, and in ascertaining a method by which we can act most suitably.

It is true there are still experienced and prominent soldiers who think that, in spite of all changes in armaments, Moltke's strategy and conduct of war is the last word on the subject, and that it is now merely a question of finding out by what principles Moltke had acted so as to be prepared for successful military operations in future as well.

I do not think that such an interpretation comes up at all to Moltke's spirit and nature. The very way *he* acted seems to prove the truth that in every war we must make use of the lessons of the past only in so far as we can apply them to, or modify them in accordance with, the changed conditions of our time. He, of all men, was the one who worked with an open mind at all that concerns the conduct of war. He never disregarded the lessons of any war, nor was he satisfied with them alone. He was ever looking ahead to turn to account new developments.

That is the way he has shown us. We are not to rest satisfied with what he has thought and done, but to go on unfettered, turning to account fresh developments. We are to examine the conditions under which a future war must be conducted without blindly believing in authorities, and, from what Moltke and the German wars of unification have taught us, to develop new ideas and principles according to modern requirements.

"How the actual operations will turn out next," writes the Field-Marshal in a memorial of November, 1861, concerning a future campaign,* "becomes more uncertain, indeed, the further we trace their progress. Yet we may consider the most likely contingencies, because they always start from given and permanently existing premises. Experience of former wars must not be neglected, but is no safe guide for our days. Half and whole centuries have since passed and changed the political and strategical situation. . . . To arrive at the result intended, the only way left to us is to trace the martial events of the future, and get thoroughly acquainted with the present conditions. Here we have to reckon partly with unknown and changeable factors, yet, on the other hand, often with known and permanent ones. We cannot arrive at a result *correct in all essentials*, but we can ascertain what is *probable*, and this, in war, is always the only basis on which we can found our measures."

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* Moltke's "Military Correspondence," Part iii., No. 4.

What the Field-Marshal expresses here seems to be of a more general application, I think, than he meant it to be. What he says of the "actual operations" applies to war in general; for is not war experience the only possible foundation of military knowledge, the material, as it were, of which theory is in need for a scientific structure of a doctrine of war, whilst the changed conditions and new phenomena of the moment always create, by their supposed future development, new assets, which in actual warfare peremptorily demand to be considered? But the past, the present, and the future are invariably dominated by the general laws which are always and everywhere inherent in war as a social phenomenon.

If, therefore, we wish to recognize the probable character of a future war and the new demands it will make on its *conduct*, we must proceed from the twofold point of view which Moltke considers necessary to adopt in weighing matters.

By the lessons which we learn from military history and our own experiences of war we must try to discern "the permanent factors" with which we have to reckon, and the laws of development. This is the only way we have for further guidance of what in war is altogether possible and feasible. War experience alone enables us to become aware of all the frictions, moral influences, chances, and personal elements in war, which all are of far-reaching importance, and almost completely beyond theoretical appreciation. But we must next closely examine under what external and internal conditions a future war must probably be conducted; how the conduct of war will be affected by the changes in military matters since we gained our last experiences in war; what effects these changes will produce. We must examine how far the results of our up-to-date war experiences will be influenced by these new phenomena, and we must try to find out in what directions this kind of influence is likely to assert itself. In this way alone can we succeed in ascertaining the conditions that will probably obtain in the next war, and in gaining some guiding rules for our action.

But that is just the point. It is not enough for us to discern the nature of modern war, and thus to some extent satisfy a theoretical want; we rather wish to be able to develop from this knowledge a doctrine for acting in the field—a law, as it were, of future victory.

If we survey the history of those wars, the course of which we can judge in some measure, we become aware of many instances where fighting dragged along without leading to a final and decisive issue. Neither side displays any special faculties that might turn the scale one way or the other. The result is then mostly some compromise between the belligerents which leaves matters pretty well as they were before, or the issue is brought about by the gradual bearing down of the weaker party. In other wars, on the contrary, a real issue is rapidly come to between two armies of apparently equal strength. Often it is the numerically weaker army which obtains the most decisive victory. When this happens, it is either a great Captain whose genius has turned the scale, or it is some particular circumstance which gave victory to the one party—a happy coincidence of favourable conditions; a numerical or tactical superiority; a special kind of armament; a moral superiority inherent in the character of an army; or a superior principle of acting. Where such peculiar advantages are placed in the hands of a great general who understands how to make a thorough use of them, success is, of course, all the greater. Our own Prussian history shows us repeatedly examples confirming the correctness of this view.

Under Frederic William I. it was discerned that the fire of infantry was the decisive factor in action. Fire tactics were therefore brought up to an extraordinary degree of perfection. The introduction of the iron ramrod proved exceedingly advantageous to increasing the rapidity of fire. The Prussian infantry is said to have delivered ten rounds * per minute even at that time. But rapidity of fire of that kind, and the precision of all movements as a *sine qua non* to it, were only possible with an iron discipline and a training which no other army could boast of to an equal degree of perfection. The Prussian infantry moved in rigid formations in an order which never failed even under the greatest stress, and thereby, as well as by its fire, proved superior to all its enemies.

Frederic the Great next recognized, immediately after the first battle he took part in, that fire and order alone would decide nothing if they were not accompanied by a resolute offensive. In further developing fire tactics, on the one hand by concentrating artillery at the decisive points, and, on the other, by making the power of fire everywhere subservient to the most determined offensive, he created a new factor of superiority over his adversaries, which asserted itself the more decisively, since he raised at the same time the manœuvring power of his troops to such a height that no other hostile army could equal him therein. He further saw that cavalry was only of tactical value under the conditions then prevailing, if it understood how to make use of the velocity of the horse by a vigorous charge. By making this idea the leading principle of cavalry tactics, he made the Prussian cavalry the most victorious in the world. And, finally, in opposition to the learned strategists of his time, he saw the inexorable nature of war. Everywhere, wherever he possibly could, he tried, strategically as well as tactically, to bring matters to a most decisive issue, giving expression to this idea also in the form of his attack. Only by thus accumulating the actual factors of superiority did he succeed in fighting victoriously against a world in arms.

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* Must be a misprint. Never known it more than five.—*Translator*.

But the linear tactics which had developed in this way degenerated after Frederic's death into a system of artificialities, without any practical value. Over the mechanical art of leading troops the spirit of the principle and guiding idea was lost ; strategy, too, set up the wildest systems. With this the Prussian army lost its all-conquering superiority. This became at once apparent in the wars of Frederic William II. The soundness of the troops, it is true, enabled them to be victorious on the battlefield, but the conduct of the war on the whole was wanting the great decisive features which result only from a clear perception of war's real nature. The conduct of war lost itself more and more in conventional forms, which were bound to have an effect all the more disadvantageous as the tactics were defective too and did not meet the new demands originating from the revolutionary wars.

In this way all the factors gradually disappeared which had made the Prussian army victorious. The wars dragged along without any decisive issue until Bonaparte appeared and brought into the conduct of war a new element of superiority. By opposing brute force to the learned and conventional mode of conducting war in his time, and by aiming at the utmost attainable with the simplest means, the great Corsican became irresistible to the armies of his age, until these in turn made use of his same principles against him, and until, by means of the Prussian army, recruited from the people by universal service, a new weapon was forged which, above all, proved superior through an idealism peculiar to that army.

This acquisition it was which led humiliated Prussia to renewed victories. By retaining universal service after the war, while all other States returned to the old system of professional armies, Prussia once more acquired a powerful superiority over her rivals. This superiority was enhanced by Prussia alone recognizing in time the importance of breech-loading arms and taking advantage of their greater efficiency. The result was the brilliant victories of 1866 and 1870-71.

It does not seem likely that under modern conditions we shall be favoured once more by Fortune in a similar manner. All the States on the Continent of Europe have introduced universal service, and have thus formed national armies; all over the world are in use the most modern and most effective weapons; everywhere a most prolific use is made of every technical appliance; everywhere in Europe the training of the troops is most zealously attended to, and the preparedness for war perfected to the utmost. A decided superiority of one army over any other can no longer be attained under these conditions. Nor can we count upon a stroke of good fortune as we had in our last wars, where a Bismarck conducted our policy, and a Moltke our armies; just as little dare we rely on the favour of special circumstances like, perhaps, a lucky political constellation, which statecraft might take advantage of with bold resolution. It may be we have, as a counterweight against the probable numerical superiority of our likely adversaries, other advantages to throw into the scale; above all an officers' corps, as no other army has, with an imperturbable offensive spirit and a uniformity of mind and feeling of duty which guarantee the steadfast and resolute action of everybody. Yet these are imponderable forces, which it is impossible to look upon as fixed factors in the reckoning, and against which must be set off the national advantages of our adversaries. Who is there that will deny, for instance, the high military qualities possessed by the French soldier, or the stubborn and often tried power of resistance of the Russians?

If it is thus impossible for us to gain a numerical or material superiority, and if, on the other hand, we have no right to claim a moral superiority for our army as a distinct asset of power, the question is forced upon us, whether it may not be possible to gain a start on our adversaries by some other means which might vouchsafe us the possibility of victory over these stronger enemies? The answer to that question we can only gather from the experiences of the past.

If we study the campaigns of great soldiers and examine the causes of their victories, we shall find that in the first instance always moral qualities enforced victory. Superior resolution, boldness, daring, and steadfastness paralyzed the energy of the enemy, and carried away the opposing troops to the performance of extraordinary deeds. The able and expert initiation and execution of all operations, as well as a correct estimate of one's own subordinates and of the adversary, also often contributed to success. But in addition to all these causes, we recognize that mostly a *superior principle of acting* was the decisive factor. Epaminondas was successful by adopting the oblique battle-order; Hannibal annihilated the Roman legions, formed in deep battle-order, by a twofold envelopment; Frederic the Great, like the great Theban General of olden times, made use of the oblique battle-order by refusing one wing, and endeavouring by an attack with a changed front to wipe out his opponent; Napoleon conquered by the shock of the reserves he had held back with the object of bringing about the decision when in the course of the combat he saw the possibility of victory; Moltke preferred envelopment initiated by the operations. He, like Napoleon, never shrunk from taking into the bargain the risks of fighting with a front reversed, when it was a question of gaining the utmost possible success. All great captains gave preference to the offensive which afforded great scope to their energies.

It must, however, be well understood *that it was not the superiority of their procedure by itself* which insured victory; their mode of action *became only superior in reference to that of their opponent* and to the *totality of the conditions governing war in the time prevailing.* Hannibal's attack formation at Cannæ became decisive through the inability of the Roman centre to deploy, as it was protected only by weak wings in dense formation. Frederic the Great won his daring offensive battles because his adversaries faced him mostly with an inactive defensive, and were unable to paralyze his bold manœuvres by suitable counter-moves, embarrassed as they were by the rigid forms and views of warfare of their time. Napoleon gained his splendid victories over the inadequate strategy and tactics of his opponents; and the principle of envelopment of Moltke's era led to success simply because the enemy did not adopt suitable counter-measures.

These reflections show us that it is above all a question of *discerning the weak points* inherent in the modern military system and conduct of war. Only by recognizing this fact may we succeed in arriving at a standard of acting, which will ensure us a *superiority*, on which we can rely.

He who fully sees and completely masters the difficulties arising from modern conditions in the conduct of war; he who has a clear and detailed insight into what can be done with modern war-appliances and what not, and how these must be used, therefore, to have the maximum effect; what, on the other hand, we must not do, so as not to upset the powerful mechanism of a modern army; he who by reason of such intelligence has arrived at clear and definite principles of acting, and is perfectly aware *of the decisive factors leading to success, particularly under modern conditions*—he will, at the outbreak of war, obtain a distinct superiority over an adversary, who from the outset either acts by wrong principles, or tries only in war itself to arrive at *that* clearness which he was unable to attain by his mental work in peace-time. This kind of superiority is, however, very much enhanced indeed if we can apply the knowledge we have obtained to the preparation for war, which, in fact, is already part of the conduct of war itself. The execution of what has been recognized as the most suitable is then greatly facilitated, and to the mental superiority, which reveals itself in the method of acting, a material superiority is added. *That* side will be superior in a way its opponent can scarcely retrieve, which, well aware of the decisive importance of the subject, has striven for, and has obtained, superiority by working at it in peace-time.

If, for instance, it should be proved that the command of the air will be the decisive factor in a future war, the army possessing the most effective aerial fleet would evidently have a decided advantage, though in other less important departments it may be inferior to its adversary.

It is, therefore, not a question of competing with our likely enemies in all the various branches without distinction, such as raising huge armies, increasing artillery and ammunition, improving heavy artillery and siege trains, extending the railway net, and employing every modern technical appliance. A competition like this would be ultimately decided by financial superiority, which we scarcely possess. We must rather exert ourselves in preparing for war in a distinct direction, and in gaining superiority not in every branch, but in the one we have recognized as the decisive one, whilst taking a correct view of all other important branches.

Much independence of thought and determination is required of him who is acting in this spirit in a responsible position and staking success in war, so to say, on one card. All depends, then, on whether a future war has been correctly estimated. Every error in decisive questions must prove fatal. Yet it is the only possible way for obtaining an unquestionable superiority, and almost every great captain has followed it.

All the more is it necessary to see perfectly clear in these matters after studying them thoroughly. We must resolutely get rid of the influence of conventional views and opinions, extend and thoroughly sift in every department the ideas we are forming about a future war, trace to their utmost limit the consequences of all that may be new in a coming war, and then try to discover with inexorable logic the weak and the decisive factors in the whole picture thus unfolded before our eyes. If we approach this task with an unbiassed mind, keep a tight rein on our imagination, and strictly adhere to realities, the investigating mind will see unveiled the mystery of a future war; the sphinx will speak, and we shall descry the law of future superiority.

If, on the other hand, we only want to learn from the experiences of former wars without developing the result of these experiences, if we only try to bring into line, more or less mechanically, the new phenomena of our time with the old views, we must resign mastering the situation and making most of it to our own advantage; in that case the war of the future will continue to be something uncertain, a riddle, the solution of which is looked for and expected by the events of the future. But the task is to solve the riddle *in advance.* That kind of mental labour must bear rich fruit. It will best prepare victory. It must be done.

It is, above all, a labour of speculative reflection, but a speculation based throughout on experience, and kept within lawful bounds by the nature of war. It must proceed critically, if we do not wish to stray from the road to knowledge, for as in all these earthly things, here, too, truth and error are not far asunder.

The notion of what is lawful can be conceived in different ways. According to Clausewitz, the theory of conducting war has no use of that notion at all in regard to *acting*, "because, owing to the changes and multiplicity of phenomena, there is in that theory no rule of sufficient general application to deserve the name of law."* War experience must be clarified by criticism, if we wish to avoid false conclusions; and speculation can lead to useful results only if soundly based on knowledge and actual conditions, and not lost in arbitrariness.

We have, therefore, first to elucidate the notion of law or constancy in war on the one hand, and, on the other, to examine, firstly, how far, and under what conditions, experience may be allowed to be an authority, so as not to be cramped by it too much or led in wrong directions; and, secondly, how far in our flight of thoughts we can give ourselves up to speculation without losing our way and making apply to the theorizer on modern war the words of Mephistopheles:

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* Clausewitz, "On War," book ii., chap. iv

"Ein Kerl, der spekuliert,
Ist wie ein Thier auf dürrer Heide;
Von einem bösen Geist im Kreis herumgeführt,
Und ringsherum liegt schöne grüne Weide."*

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* Which may be rendered somewhat like this:

"A fellow, theorizing,
Is like a beast on barren heath;
An evil spirit fooling it about,
And yet around lies fairest pasture-land."

Translator.

CHAPTER II

CONSTANCY IN WAR

Changing and permanent elements of war, p. 30—Immutable and periodical laws of war, p. 31—Importance of this double-headed constancy for the theory of war, p. 32—The immutable laws of warfare, p. 32—The periodical laws of warfare, p. 35—The constancy of development, p. 37—Constant development of cavalry tactics, p. 38—Mutual relationship between supplying from magazines and military operations, p. 41—Importance of constancy when acting in the field, p. 43.

If we review the whole of military history as far as we have access to it, we become aware of an infinite series of different forms of war; war we see constantly changing. "War," says Clausewitz, "is a perfect chameleon, because in each separate case it changes somewhat its nature." *

The conditions under which wars are conducted are ever new ones. They result from the state of civilization of the nations and their social life; from the efficiency of their technical appliances, finances, and other resources of the States, and from the nature of their military institutions. They depend on the position and character of the theatres of war and of the belligerent States; they are influenced by historical traditions, and certainly a great deal by political circumstances—in short, by a countless number of all sorts of things constantly changing, and thus causing

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* Clausewitz, "On War," book i., chap. i., par. 28.

war also to appear in an ever varying form. We thus seem to move in war altogether in an absolutely unstable and ever changing element, with no fixed standard of opinion and norm for acting. This, however, is true only up to a certain point.

If we look closer into the military events, we perceive that in war, as in almost all other spheres of life, a certain constancy reigns supreme; that certain features constantly recur; that certain relations between mode of action and success often remain the same; that certain circumstances and moments have over and over again proved decisive, whilst no doubt the mass of individual incidents bears the character of the changeable or accidental.

If we try to account for the nature of this apparent contradiction, we soon come to recognize that, as with all things in the visible world, it is the form only which changes, while matter externally remains the same; so in war we must as well distinguish strictly between its outward appearance in form and its real nature. The former is mutable and ever transient, the latter is, however, always and under all conditions the same. Now, if we apply the term "Law" only to the relation of things to, and their effect on, each other, but the term "Principle" to a distinct mode of action resting on the lawfulness or constancy of things, then, in compliance with the nature and the form of war, there must be also two different kinds of laws and principles. A lasting validity can be attributed to constancy only in so far as it is part of the nature of war itself and independent of whatever form a war assumes. To the laws and principles of warfare, however, which are occasioned by the outward form of war, we cannot otherwise than assign but a transient validity. These laws and principles become worn out like the social conditions of which they are the outcome; they want, therefore, constantly to be checked and further developed to remain of practical use, and not hamper the freedom of proper action by dead routine.

It is evident how eminently important it is for practical purposes to recognize and correctly separate these two groups of laws. While the former represent *the constant norm of all acting* in war, the latter embrace *all progress* in military matters by rightly discerning and timely developing them.

It is exceedingly remarkable that neither the theorizers on war, nor the teachers of practical warfare, have hitherto become aware of this so striking difference in the laws on which the conduct of war is based.

It is true that Clausewitz also takes war in its simplest form when appreciating the fundamental principles of war, but then he does not draw all the conclusions from this correct elementary idea, the logical further development of which will necessarily lead to the separation of what is constant in war according to its nature and according to its form, and which must greatly facilitate the building up of a theory of war. It reduces to a system a subject hitherto altogether vague, and creates a sure foundation on which the doctrine of war must firmly rest so as not to become arbitrary.

That doctrine has now to solve a two-fold task.

Firstly—but once only—the task of exhaustively establishing the immutable laws of war, and then the perpetual task of incessantly adapting the practical doctrine of war to the transient forms of war within the limits prescribed by these laws. So long as we do not submit to this kind of system, the attempt of setting up a satisfactory doctrine of war must always fail, owing to its intrinsic impossibility.

In order to solve the first of the two tasks we must strip war of all its outward form, and rid it of all that is accidental, changeable, and dependent on special circumstances. In that case there remain, as far as I can see, *three* factors ruling war as such, no matter under what conditions it is waged, whether as a combat of individuals or of peoples, whether it is fought between savages or highly civilized nations.

Firstly, from its nature, the *object of war* is always the same: we wish, as Clausewitz has already defined it, to impose our will on that of the enemy, by either annihilating or damaging him, or warding him off; or, maybe, we want to force him to do, or to give up, what is to our advantage. Secondly, every combat is governed by the law of *attack and defence.* An action outside the limit of these two notions is altogether unthinkable. And, thirdly, all actions in war are *influenced by the physical, mental, and moral qualities of men.*

All laws and principles which can be derived directly and purely from these three factors must evidently be looked upon as permanent laws and of general application in war, which retain their decisive influence under all circumstances.

But in a certain sense the character of the theatre of war also accounts for some definite features of an invariable type.

In war on land, ground and the action of troops affect each other in many ways, always in the same manner. Defiles oblige us to decrease the front if we wish to pass them; steep gradients render upward movements difficult; eminences afford good view; ranges of hills cover from sight and direct fire; and similar instances of general application may be cited frequently. Naval warfare, on the other hand, is enacted on a storm-swept plain, and is subject to certain immutable laws from the nature of the sea. The same applies to the air and to the combats we shall see there in the future. The influence exercised by these conditions does not, of course, originate directly from the nature of war itself, but they create the modifications under which war is altogether proceeding. We must in many ways assign to these conditions also a permanent and systematic importance which we *cannot* disregard at all. But taking the theatre of war as given, there remain but the three factors—the *object*, the *form of action*, and *human nature*—which determine the permanent soul of war from which the immutable laws of the art of war must be deducted.

The impossibility of theoretically developing these laws in their totality must be plain to everybody. Nobody, for instance, can range under a systematic law the effect of the infinite variety of psychical forces displayed by men under most diversified conditions. We stand here apparently helpless before an unfathomable depth, and must summon experience to guide us. We must critically examine by what principle the greatest captains of all ages were guided in their action; what, after a just inquiry, was ultimately and essentially the decisive factor of their success or failure; the reciprocal effect frequently recurring between mode of action and success—all this we must critically examine, strip it of all that is ephemeral, local, and accidental, and test whether a general principle derived from the nature of war underlies all this. In this way we shall be able to discover, if not altogether all the laws of war, then at least the most important principles of practical warfare derived from the constancy of what we observe.

Matters are quite different as regards that constancy in the conduct of war, which I should like to call "periodical," because its validity is limited by time. Though it may be impossible to develop the laws of general application in their entirety, we can, on the other hand, convincingly prove at least their lasting importance. This we cannot do with the periodical laws. There we have no test at all whether a certain incident is constant or accidental within the form of war of which it is part, and where it therefore occurs under certain given conditions. The most we can do is to prove that it is not inconsistent with the broad general laws of war; but that does not yet prove that the *incident itself* has an importance founded on the principle of constancy. This fact alone explains the tremendous vagueness of the art of war—namely, the infinite variety of views and the impossibility of qualifying any opinion in this sphere as absolutely correct. Nevertheless, principles of this kind are as necessary for the practical conduct of war as are the general laws which form its basis. All military actions are regulated by them from day to day. All tactical regulations as well as all measures of organization are due to them. To describe these convincingly and to explain them clearly is the purport of every practical doctrine of war.

The difficulty of discovering irrefutably these important principles of warfare is chiefly due to the fact that it is very hard, on the one hand, to procure the material facts free from objections, from which these principles must be derived, and that, on the other hand, we all may look upon this material from a very different point of view. And, indeed, we find that the same experiences of war are not always judged alike in the different armies, and that new phenomena in the military world are not seldom appreciated differently.

It will, therefore, never be possible to arrive at incontrovertible results in all that concerns military matters, as they are so uncertain and changing, but we must rely on the theory of probabilities. To get as near to certainty as possible by it said will be the most we can hope to attain. Yet even then, in so far as it concerns principles derived from experience of war, we have to get over one difficulty more, and that is, we must find out whether the conditions are still the same as those under which a certain law was recognized as being a guide for us; whether we are, therefore, allowed to apply the principles resulting from that law straight to our own action in the present, or even in the future, without coming into conflict with the reality of things. The conditions continually change which determine the essential features of war, and it is not always easy to determine the amount and the kind of that change and its probable influence on the incidents of a future war.

These comments show that, if it is, on the one hand, of the greatest importance to formulate distinct principles for acting in the field, it is, on the other hand, exceedingly difficult to recognize the permanency of future phenomena from which such principles can be derived.

Yet the historical development of things affords us a certain clue to form a judgment. In this development there is a certain constancy, too, which is inherent in the nature of the things themselves, making it often possible to conclude from the first links of a chain of development with which we are acquainted by experience to the next links, and to recognize by induction, as it were, what will be the reality in future.

The outward conditions determining war, we know, do not change by leaps and bounds, but do so gradually. Even the most momentous inventions and important social revolutions do not suddenly produce a change of all the factors influencing war. Thus it has taken centuries after the invention of gunpowder before fire-fight obtained its own, and it is scarcely possible to gauge to-day the probable effect of aerial navigation on the future conduct of war; for it is almost always impossible to discern the full significance of new inventions and innovations, and to account for them by suitable measures. In conformity with the slow change of the ruling factors, the laws governing the mutual relationship of things, and, jointly with these laws, the periodical principles of warfare as well, change but gradually. That which in the past was fundamentally right may therefore often be so in the present, in spite of certain developments having occurred, and form as a rule a reliable guide for recognizing the future, because things will develop lawfully, and, to a certain degree, can therefore be determined in advance, at least by reasoning. A few examples will suffice to show how the past in this way can be made to serve the future.

It is at once plain that neither Frederic's nor Napoleon's principles of warfare as evolved by their own peculiar time could have been applied unaltered to the campaign of 1870, because the outward conditions of war had materially changed. Nor is it likely that the experiences of this latter war can be forthwith applied in the future. Yet, if we review these three periods of war in connection with each other, we can gather from them much that is instructive for the future. Common to all was, for instance, the use of firearms for decisive action, and although their effect has enormously increased in every way, certain conditions for their use have remained the same, and must remain the same in future as well, so long as we are going to fight with firearms at all. I shall return to this train of thought at another place. Still more instructive are these wars of the past as regards the cavalry. In the fights of Frederic's period that arm positively played the decisive rôle; in the Napoleonic Wars cavalry became a less decisive factor in battle, and still later it lost more and more its purely tactical importance. What happened is quite natural.

The short range and low rate of fire of flint-locks allowed the cavalry to cross the dangerous zone without suffering losses that might have impaired its fighting power. The small power of resistance and low mobility inherent in the linear fighting formations, especially on the flanks, considerably increased the chances of success if the charge could be delivered from the side; but when the fire of the enemy was much strengthened by artillery, when a frontal attack became necessary, and the ground to be charged over was little favourable, the chances of a successful charge were lowered. The charge of the Bayreuth Dragoons at Hohenfriedberg, and Seydlitz's vain attack at Kunersdorf, are the two opposites of *those* conditions which render success easy or the reverse.

In the Napoleonic Wars the column tactics increased the infantry's capacity of resistance against cavalry charges; the whole mode of fighting in separate divisions and corps localized the success of cavalry more than did the linear tactics, where the army acted as an integer. The fact, too, affected cavalry unfavourably, that actions were much less than formerly restricted to the plain, and that portions of the infantry were extended into skirmishing lines, which did not present a favourable object to a charge; accordingly the tactical importance of cavalry decreased.

When next the firearms were still further improved, when the importance of skirmishing action increased, when the infantry in consequence looked more and more for ground affording cover, and when the battlefields became larger in extent, the cavalry stepped more and more into the background as a factor in battle. This was almost unconsciously acknowledged by reducing the strength of cavalry more and more in proportion to the other arms.

In this process we can evidently trace the lawful action of the force of circumstances, and we have a right to conclude that the cavalry, as an offensive weapon in the battles of the future, will lose still more of its importance than it has done hitherto. This is not only probable, but certain, since all the conditions impairing the success of a charge have further developed in a manner that could not be anticipated; but the circumstances which increase the chances of charging are not many. As regards the latter, the only point we can mention is that in future bodies of infantry, loosely organized and morally incapable of much resistance, will often be employed, and these will not always be able to make a proper use of their weapons. But as regards the former, the factors disadvantageous to a cavalry charge are almost overwhelming. The effect of firearms on cavalry is now simply destructive. The actions are fought in the main on ground rendering movements of cavalry difficult; in numbers the cavalry has been reduced to a mere fraction of the army; the battlefields have increased in size, and the infantry fighting formations nowhere present a suitable object for cavalry to charge on. These are facts with which we have to reckon. But we can, on the other hand, conclude from the past that in all those cases where, owing to favourable ground or the demoralization of the hostile troops, fire-effect is neutralized and tactical formations are disorganized, successful charges are still possible even to-day, though they can never again have the same decisive influence on the whole issue of the battle as in former days. It will be the same if we succeed in charging the flank of infantry deployed for action, but insufficiently secured in that direction, since modern battles are fought again, as in the days of

Frederic the Great, in linear forms, with all their disadvantages. Nor must we forget that the great difference in the speed of infantry and cavalry is still unaltered, and that all the advantages accruing therefrom to cavalry are just the same as before.

If we sum up all these conditions in our verdict, we are justified, I think, in saying that we must, above all, make the fullest use of *that* superiority of the mounted arm—which is its strategic mobility—if we wish to derive real advantages from our cavalry. This argument is confirmed also by experience. We have seen already in the American War of Secession what effect the cavalry can produce in this direction, and also in the South African War the mounted Boers always succeeded in meeting the turning movements of the English infantry, and the English, on the other hand, in making use of their mounted troops for constantly and successfully turning the Boer positions. The practical application of this is as obvious as the cognition that we are dealing here with a regular order of things, which is intelligible to anyone who is viewing the subject without bias.

Another example from the doctrines of strategy will explain still further my ideas about the regularity of development:

At the time of Frederic the Great the armies were greatly dependent on supplies from magazines, or, at least, they thought they were. Every pressure on their own lines of communication seemed to them a great danger, every threat on those of the enemy a great success. The pressure on the enemy's lines of communication became thus one of the most important maxims of operations. Napoleon, on the other hand, supplied his armies chiefly from the resources of the theatre of war. By this he made himself almost entirely independent of supplies from depots. A pressure on his lines of communication affected him little; tactical victory put an end to all anxiety caused by this pressure. His procedure was no doubt very advantageous so long as he was able to subsist on the country and sure of tactical victory. The moment he failed in both, as in Russia, the army perished from want of regular supplies from magazines. In the campaign of 1870-71 we used Napoleon's system in combination with supplies from depots, which answered well in opulent France. But we would grievously err should we think that this was the last word on the subject; and when Field-Marshal v. der Goltz lays it down as law that we need not mind a threat to our lines of communication, but must, by striking forward, force the enemy to abandon his threats,* the validity of such a law is very limited, and rather applicable only if we are sure of victory and can live on the country without needing the lines of communication during the time before we gain the victory. But if in future, as will be most likely the case, situations arise in which armies are really dependent on supplies from depots, the strategic importance of the lines of communication will again assert itself to an enhanced degree, and similar principles in the conduct of war will prove necessary as they—*mutatis mutandis*—obtained at Frederic's time.

The examples cited will suffice to make it clear in what way the development of military matters is subject to certain organic laws, and how greatly their cognition may give us hints for shaping the future—hints which must be decisive for military speculation if that is not to lose itself in boundless regions.

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* v. der Goltz, "Krieg und Heerführung," 1901.

The constancy manifesting itself in a variety of ways in war and in all that concerns war is thus in every direction the determinant for the doctrine of war. *But we must guard against* wishing to coin it into definite *laws of acting* and into binding *rules for the practical conduct of war,* which are only too apt to be used as thumb-rules, and then become a fetter to freedom of action. We must rather remain constantly aware that from such constancy nothing but general principles and norms of acting can be deduced which nowhere restrict freedom of action, and, in so far as they are not of a nature to apply generally, must in their application always appear in different forms in compliance with the changes in armaments and in the conduct of war.

CHAPTER III

EXPERIENCE OF WAR AND SPECULATION

The nature of experience of war, p. 44—Necessity of studying military history, p. 46—Points of view for studying military history, p. 47—Material and moral requirements for studying military history, p. 50—Problematical nature of all experience of war, p. 50—The conduct of war an art, p. 52—General points of view for speculating on the future, p. 54—Causes of speculative errors, p. 55—Speculation a preliminary condition of progress, p. 57—Demands on speculative procedure, p. 58—Resolve to make changes, p. 59—Uniformity of standpoint and relative value of things, p. 59.

Every doctrine of the art of war rests on two pillars—namely, on the cognition of the past—that is to say, on war experience—and on the speculative weighing of the probable development of all the factors determining and shaping war. All that we know of war is experience that has become knowledge. All action in war and for war is based on speculation which has that knowledge for its foundation. Speculating rightly is what a commander's mental labours consist of. To be perfectly clear about the nature of this only foundation of our knowledge is, therefore, an absolute necessity for all military studies.

War experience may first be personal. He who has had the privilege of acquiring such, especially in high positions, not only enjoys a great advantage when judging about military questions, but also, and above all, when designing and executing military operations.

He knows from personal observation the element in which he has to swim—that is to say, in which he has to act. He himself has felt the weight of responsibility to which all action in war has to submit. He knows from personal observation the element of danger and uncertainty prevailing everywhere in war; he knows what it means to preserve an open mind and elasticity of will under aggravating circumstances, under the pressure of utmost physical fatigue, or of the inclemency of weather. He has personally become aware of the frictions in the war machine; he himself has seen what keeps it efficient, what causes trouble; he was a close witness of the consequences of vacillation and of resolution; he has known the influence which war has on different characters and on the troops. To him war does not present any kind of feature unknown to him; on the other hand, it is in the nature of things that his experience refers more to the *single* incidents of war and affords him no measure for gauging what is founded on principles. He is, moreover, not far removed from the danger of being led, by the vividness of the impressions gained, to generalize the results of his personal experiences, and to look upon them ultimately as of general application.

Anybody who, for instance, at Mars-la-Tour—Vionville, has seen the Prussian infantry fighting, conquering, and steadfastly maintaining the ground captured without any formation in depth, will never forget in all his life the overpowering impression the heroic combat must have made upon his mind; and he will have acquired a reliable gauge for what good infantry, properly trained, is capable of performing. But should he feel inclined to generalize on what he has experienced there, and to consider the form of tactics imposed upon the Prussian infantry by the force of circumstances, and leading to comparative success only in the face of an absolutely inactive enemy, as a fighting formation suitable altogether for infantry, would surely be getting on a wrong and highly dangerous track.

Personal experience wants, therefore, constantly to be supplemented and corrected by comparison with the experience of others and with the results of researches in military history. Closest examination is needed before venturing on deducting principles from personal experience. We thus see, for instance, General v. Moltke studying industriously military history, not only throughout his life, but taking up these studies more especially after 1866, in order to test and enlarge his own experiences by the facts of military history. On the other hand, personal experience of war, again, very greatly facilitates understanding and studying historical events.

To-day, however, but very few are privileged to gather sufficient personal experience of war. The longer peace lasts, the more the number of *those* men dwindles away, especially in Germany, who know war as yet from personal experience; and so we have, on the whole, nothing else left but to gather martial experience from military history, and to build up on the lessons learned from that history the norms for future acting. We have therefore to consider in what way the study of military history may be made to serve its purpose.

When we become aware of a series of martial actions, our sentiment is first affected.

Where we notice irresolution and weakness, want of moral and of personal courage, where we see men actuated by vulgar, selfish, or personal motives, we are repulsed and feel disgust. Great deeds, heroic conduct, firmness under misfortune, boldness in acting, however, elevate our hearts, if we are at all capable of superior feelings (which, especially in our time, does not apply to all men), and incite us to emulation. Both these influences act together to rouse in noble hearts that passionate enthusiasm for all that is great and heroic, that noble ambition which strives for the highest—in short, that elevated frame of mind which alone enables us to perform really great deeds. Here we gain the impulse to military self-education, and for developing our own character. This psychical influence, however, defies all theoretical discussion; it develops in us intentions; it creates in us the power of commanding. But the actual commanding in war under its intricate conditions is not the result of psychical stimulation alone. Commanding in a war of civilized nations must be learned. We must therefore allow martial experience to act also on our reason, so as to draw intellectual knowledge from that experience.

First of all it will be a question of discovering constancy of war in all its many relations, and of deducing from it, on the one hand, principles for our actions, and, on the other, views of how things will develop in future. Next, the study of military history is also to make up for the want of personal experience of war, and to supplement it. It is here of great consequence to get, above all, a thorough grasp of the active nature of war. We must trace the events in all their ramifications, and try to ascertain their final causes and ultimate consequences; we must try to find out the general views held by the commanders, and the prejudices and opinions prevailing at the time of the war which we are examining; we must search for the political influences that were trying to assert themselves on the conduct of that war; we must, above all, endeavour to become acquainted with the personalities of the leading commanders, and with the motives which guided them; likewise with the character and the efficiency of the troops on both sides, with their weapons and the effect of the latter in action, and with the whole system of supply, with all its far-reaching consequences. Not before we have gained a full knowledge of all these military facts can we correctly appreciate the mental and material forces which rule in war and determine its nature; only when we understand all this can we develop in us that tact of judgment which teaches us to assign its true value to all things and their mutual relationship; which confers on us the right feeling for what is possible in war under most varied conditions; which in the end has often to step in where our reflections have to deal with unknown or undefinable factors, and which alone is able to some extent to make up for genius.

These points of view must settle the manner and extent of studying military history.

When it is a question of gaining *general* views, of fixing typical events, and of ascertaining ruling laws, we must try to survey large periods in a uniform manner. It is only from an elevated standpoint that we can discern what is common to all events, similar to the eye that can only from the top of a prominent hill grasp in broad outline the connection of a much ramified country, with its ranges, ravines, necks, and watersheds. We will, then, do best to comprehend the wars in groups of a character as much as possible uniform, so as to be able to discover in them the periodical laws, and to judge the events throughout from a uniform point of view. If, however, we wish to discover the *practical manifestations* of war, the forces, the mutual relationships, and the accidents working in it—if we must, therefore, try to enter into the details of the military drama, it is then as well to limit our studies, and to deal, above all, with the more recent military events as evidently the most useful. General principles of warfare we can certainly gather from the study of long-past events, but when it becomes a question of obtaining practical hints for our own action in strategy and tactics, it is advisable to select campaigns which to some extent are still directly connected with the present, and which therefore give at least a certain clue as to the future, because the general conditions of warfare will, broadly at least, be still the same. We will, besides, be able to discover more readily in each single case the special circumstances in a war nearer to our time than in one more remote, where the events are lost in ancient history; and it is just these special circumstances which are often the most decisive factors.

If, therefore, we wish to study war in this sense to-day, we must not go farther back than 1866. The combats of that year, it can scarcely be denied, finally finished that period of warfare which may generally be termed Napoleonic. The events of that war often remind us still of the Napoleonic epoch. But we can, on the other hand, clearly discern the beginning of new developments. The introduction of the needle-gun and Moltke's strategy very distinctly indicate the approach of a new period. In the war of 1870-71 those features appeared already in distinct outline—and more distinctly than in some of the more recent wars—which in all probability will give the stamp to the next European war.

But in whatever way we may study military history, whether we try to discover the great fundamental principles of all warfare, or try—like the scientist with his microscope—to trace the minutest details of events, we must always comply with the dictates of stringent impartial and comprehensive investigation, if we wish to arrive at useful results. All superficial study of military history is not only to no purpose, but is downright harmful, because it far too easily leads to wrong conclusions, based on mistaken knowledge of the subject. It would be quite deceptive also, should we wish to judge of the expediency or error of an action by its success or failure alone; for we as men can, of course, only strive for success by trying to act suitably, but success itself is subordinate to superior laws which are imponderable and hidden from us.

The study of military history, however, in a manner that alone will promise real success meets with extraordinary difficulties. If the events are rather ancient, it is often impossible to trace important details explaining matters; if the events are of recent date, the details cannot be examined, chiefly for political or personal reasons, and truth is hidden in the archives and in the bosoms of the actors.

Even the plain descriptions of events by the participants themselves far too easily contain errors and wrong data, caused by ignorance of the connection of events and by deceptive memory; or suit vanity, factions, and political or other personal considerations. The inner working and moving powers are more often than not kept dark, all the more as they would otherwise far too often expose weakness or dishonesty, or because it is believed that real or apparent interests might be hurt by making them known. Many motives, influences, and mutual effects—*e.g.*, between form of attack, effect of arms, and country, wrong reading or wrong transmission of orders, and similar matters—can only be ascertained at all from the recollections and communications difficult to get from the persons concerned; and, finally, in war, as with the fate of all men, unseen forces act, producing often incalculable results in a manner seemingly most contradictory, and becoming clear sometimes like flashes to a genius only, for in war, too, the poet's word holds good—

> "Das Schicksal führt an unsichtbarem Band
> Den Menschen auf geheimnisvollen Pfaden,
> Doch über ihm wacht eine Götterhand,
> Und wunderbar entwirret sich der Faden."
>
> SCHILLER.*

If experience of war in its various forms is thus the necessary fundament for the doctrine of war and its further development, it is, on the other hand, itself of an extremely changing and problematical nature.

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* Which may be rendered somewhat like this :

> "Fate leads men by strings invisible
> On paths and tracks mysterious,
> But some hand watches over him,
> And plain will all be in the end."
>
> TRANSLATOR.

We can only say this much in general, that the deeper we inquire, the less we stick to the surface of things; the more we try to free ourselves from bias of opinions, and the more we strive for truth without prejudice, the more will our results have a claim to be heard.

But the doctrine of war, from its very nature, can rest perfectly satisfied with this kind of war experience. That doctrine is not an exact science which is bound to develop on a distinct line with logical necessity: it is something living itself, and capable of many developments. It admits of all kinds of views, and it is the very existence of these different opinions that gives the physically weaker the chance of gaining mental superiority, and through it insuring success, which is, after all, mainly dependent, not on what we know, but, above all, on what we can do, knowledge forming but one, though a very necessary, factor.

Conducting war is not a *science* only, it is more than that—it is an *art*.

Science always strives to solve in a complete form and to the satisfaction of all demands of reason the problems set; art knows that there is no complete theory at all to solve *its* problems. The most exalted thing it produces is the very something imponderable which defies being limited by reason. To perceive is not its end, but a preliminary condition for producing. So in the exercise of the art of war, successful activity may be advanced by the clearness of intellect, but is not insured by such clearness alone; and a military commander, though mastering his profession, is, in the first instance, not so much concerned with the theoretical knowledge of warfare, as with what he feels in every situation in war to be expedient or the reverse, effective or pernicious; with the military tact which hits upon the right thing, almost unconsciously as it looks; and with the power of personality which never fails to act, and which knows how to master men and matters. This sort of self-assurance and of will-power is mostly the result of inborn talent and character. But we can strengthen and fully develop in us these qualities by constantly recurring to the study of military history.

Success, however, will only be attained by him who passionately strives for truth. He, on the other hand, who searches in military history merely for the confirmation of his preconceived notions, is satisfied with general facts, or is even swayed by minor motives, which have nothing to do with the matter itself, may be sure of arriving at false conclusions which are bound to lead him astray. Clausewitz has found the right word in regard to this, too. When enlarging upon the importance of military history for a doctrine of war he writes: "It would deserve the highest credit to teach the art of war entirely by examples from military history. Anyone who should feel called upon by an inner voice to undertake such a task, let him prepare himself for his pious enterprise as for a long pilgrimage. He must sacrifice time and shun no efforts; he must not be afraid of the powers that be and of the great of the land; he must rise above all feelings of personal vanity and of false shame, so as to speak the truth, the whole truth, and nothing but the truth."*

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* Clausewitz, "Vom Kriege," book ii., chap. vi.

The study of military history as a foundation for the practical art of war thus demands from us, not only the power of military discernment and a training in critically examining history, but also a great moral force, which, conscious of its responsible task, must not allow itself to be impaired in its absolute efforts to find the full and plain truth.

But the same demands are made upon the other part of the task—namely, the speculative estimation of the future, and the practical deductions derived from it for war. Anyone who is occupied in this direction on account of his professional duties, or who is driven to it by his own impulses, must be prepared for severe struggles in the world as it is, and should face them with the firm will never to sacrifice the principles of his convictions in deference to matters not justified by the thing itself. He may be sure that only the full might of his personality, with all its strength derived from conviction and the goodness of the object, will secure him victory in his contest with vanity, bias, narrow-mindedness, inordinate ambitions, and selfishness. At the same time, he must be clear that only *that* kind of conviction is able to carry its point permanently and usefully which is justified in itself and meets the demands of actuality. These considerations will cause him in a certain sense to mistrust his own judgment; he will become aware of the fact that all human thoughts and actions are tinged by personal one-sidedness, and he will, therefore, do all he can to re-examine always afresh the results of his own researches by the light of the reflections of others, so as to clarify them in the conflict of opinions. He must, on the other hand, also strive to make his studies and reflections by a scientific method, affording him a certain security of arriving at healthy and sound results. For history proves that the theory of war has often struck fatal paths, leading too often to serious defeats in war itself.

There are, above all, two modes of view from which errors arise.

The one method, it is true, starts from actualities. It takes the successful combats of victorious generals as the basis of its reflections; tries to prove a certain constancy in these combats; deduces from this constancy certain rules and principles, and then, attributing to them a general validity, frames on them a theory of war, which, seemingly built upon historical ground, fascinates the masses all the more readily when it claims for itself the authority of a great captain like Napoleon or Moltke. A classical example of this sort is Jomini.* When we read him, there is apparently nothing problematical in war; rules and laws insuring success are laid down for every act, and we begin to think that the great Corsican gained his laurels merely by the fact that he conscientiously adhered to the rules construed from his wars by his critics after the events. Jomini actually does the worst possible violence to the deeds of Napoleon. He—often quite arbitrarily—presses them into a system which he foists on Napoleon, and, in doing so, completely fails to see what, above all, really constitutes the greatness of this captain—namely, the reckless boldness of his operations, where, scoffing at all theory, he always tried to do what suited each occasion best.

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* Baron H. de Jomini, "Traité des Grandes Opération Militaires," contenant l'histoire critique des campagnes de Frédéric II., comparées à celles de l'Empereur Napoléon. Ten volumes and two atlases. Paris, 1811 to 1816. "Vie Politique et Militaire de Napoléon racontée par lui-même au Tribunal de César, d'Alexandre et de Frédéric." Four volumes. Paris, 1827. "Introduction à l'Étude des Grandes Combinaisons de la Stratégie et de la Tactique." Paris, 1830

A like tendency has begun to assert itself also in reference to Moltke's conduct of war. On him, too, who conducted operations in the wars for a united Germany, people try to father a theory. One version has it that the strategy of the Field-Marshal rests on the relative dependency of the length of marches and the depth of columns; the other that Moltke had given preference to exterior lines as a matter of principle, and had imparted to us the knowledge that nothing but envelopment leads to success. In opposition to all previous great captains, he is also said to have made the doctrine law, that all forces must effect their junction on the battlefield and not be concentrated for battle beforehand.

In all these views there is, as in those of Jomini, a mixture of truth and fancy. They are often correct within a limited sense, yet are not in full accord with the actual facts, as an intimate critical investigation of Moltke's ideas and deeds will reveal. But even granted that Field-Marshal Moltke had thought as his critics have subsequently implied to him, it would, nevertheless, be inadmissible to generalize his ideas, and make them forthwith the guide for all future action.

The other method of viewing things, which is bound to lead to faulty results, I should like to call the purely theoretical and conventional method. It does not start exactly from military history; it rather tries to develop the theory of war from a series of conventional conditions and opinions gained *a priori*, which ultimately, it is true, rest on experience of war as well, but have lost their true meaning long ago through purely theoretical development. This method tries to regulate all martial action by lines and angles, or to rob it of its freedom by regular rules. It has led to systems which made operations in the midst of the most fertile countries dependent on the systematic movements of bread-waggons, which made operations subservient to geographical and topographical conditions, or tried to check their free scope by the strait-jacket of geometrical figures—systems certainly fascinating through the semblance of their profound scientific nature, but leading ultimately to a perfect misconception of what war itself really means. In this way the sword of the warrior—to use the same metaphor as Clausewitz—was exchanged for that of the courtier, which snapped, of course, when it came to actual blows.

Both methods are not altogether wrong, and if, in spite of that, they often went astray, and cannot be a safe guide in future, it is their one-sidedness and arbitrary restrictions which are at fault. The importance of theoretical speculation for the development of all that concerns war is not affected by the fact that it often arrived at one-sided results by defective methods. Speculation is a *preliminary* rather *necessary to all progress* in warfare, so long as it proceeds methodically, and is not advancing conclusions based on premises that are not and cannot be proved, and on which a logically arranged system may certainly be erected, but which is, for all that, built on sand.

Two points we must, above all, keep in view:

Firstly, we must strive to develop things as we find them, dismissing at the same time all arbitrariness. We must thoroughly examine them on their real merit, and endeavour to recognize the lawfulness of their origin, as well as the causes and limits of their efficiency. From these data we must try to deduce how things will naturally further develop under the influence of new achievements in the technical and social world, or of altered conditions for the conduct of war. Foreseeing, promoting, and making the most of natural developments to the advantage of the army, is the way to true progress. New inventions in the province of armaments or military mechanics generally must be thoroughly tested by trials in peace, under conditions as near to war as possible, before drawing conclusions as to their efficiency and importance for the conduct of war, and before making practical use of them. To misjudge the importance of momentous inventions is often more dangerous than overestimating new achievements.

The second demand to be satisfied by speculation consists in never allowing ourselves to be dominated by some individual manifestation, however important it may look in appearance, and thus to determine the future development of all that concerns war from a one-sided standpoint. So long as we approach things with a preconceived notion, or view them even, as it were, in the spirit of red tape, we can never form a true judgment of their real value. Every one-sided standpoint in regard to arms, for instance, which has done so much harm very often, cannot be condemned too strongly. We must strive rather to view every individual manifestation within the compass of military action as a whole, and tactical and strategical conditions in their mutual relationship; due regard we must also pay to the influence of social conditions on the army. We can but then determine *the relative value* of things, which is *the only real value* for purposes of war, and make a true estimate of their importance for the future.

Being thus warned by these circumstances to exercise the greatest circumspection and caution when speculating on the future development of things, we must, on the other hand, have the courage of thinking over the ideas and opinions recognized as correct as far as we can possibly go, and not be afraid of turning them into deeds, though our opinions may not be supported by experience, or are even contrary to the opinions prevailing. The greatest successes have often been enforced against public opinion, and even under the protest of so-called experts, who are often enthralled by tradition. Lastly, our judgment must never be swayed by influences outside the thing itself, possibly by political, personal, financial, or social regards. This sort of deference is only too apt to cloud the clearness and objectivity of our verdict, and to influence disadvantageously developments in the future.

Wherever we view war, which stirs the living organism of the nations to its utmost depth, we certainly see the broad connections between the social conditions and army matters; but we shall never be able to develop the doctrine of future war in sound and practical fashion if we do not succeed in gaining for that doctrine points of view from which we can see things in their true light. If we then subordinate all the demands made upon us by the various details in the conduct of war to these guiding points of view, according to their relative importance, we must succeed in establishing a harmony of forces and their mutual relationship, which will serve us to act in a proper way, and prove nowhere a hindrance.

From this standpoint I will try to examine critically, with a view to future war, all that concerns war in its various branches, to bring them into relation with each other, and to assign to the various factors in the conduct of war their relative importance from a uniform point of view. It is my conviction that in this way only can we develop the guiding ideas which must in future be decisive for the preparation of war as well as for the action of any commander, and* what to-day, as yet,

> ". . . . in schwankender Erscheinung schwebt,
> Befestigen mit dauernden Gedanken."
>
> GOETHE.

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[*] "Fix in permanent outline what to-day is as yet vague and uncertain."—*Translator.*

II

ELEMENTS OF MODERN WAR

CHAPTER I

ARMIES OF MASSES

General levy in war of to-day, p. 61—Increased influence of national character on the army, p. 63—Altered political importance of war, p. 63—Economical effects of the war of masses, p. 64—Greater difficulty of training owing to numbers, p. 67—Altered tactical value of the troops, p. 67—Greater difficulty in the conduct of war, owing to numbers, p. 68—Inferior mobility of modern armies, p. 69—Different tactical value of troops of the first line, p. 70—Tactical difficulties when dealing with armies of masses, p. 71—Danger of armies of masses, p. 72—Concentration of the whole force at the beginning of war, p. 73—Altered character of operations afterwards, p. 75—Similar conditions in the war of 1870-71, p. 75—Uniform character of the Russo-Japanese War, p. 76—Double nature of future war, p. 77.

Of all the features which are destined to influence the conduct of war under present conditions, and cause it to strike new lines, it is the levy of masses, above all, which no doubt will give its peculiar stamp to the next war.

In the Central European States the whole male population, as far as it is able to carry arms, will be called up, armed, and organized in tactical formations. In case of any hostile invasions, it is more likely than not that a "people's war" would be organized in the true sense of its meaning. The obligation of every citizen to serve is a generally accepted principle.

It is true, not all those obliged to serve are given a military training in peace-time. In Germany, for instance, this is far from being a fact for some time past. Yet everywhere enormous hosts are to be mobilized in case of war, not only for the defence of the native soil, but also for attack. It is right to some extent to speak of the armies of millions of modern times, the like of which have not been seen before in history.

It is, of course, out of the question that armies like these can be of a uniform character. We must distinguish various categories of them. There are in Europe militia armies and standing armies, which are absolutely different in character. In the latter the line regiments, augmented on mobilization by the latest annual contingents of reserves, and numbering in their ranks most of the regular officers and non-commissioned officers, are more efficient than troops of the second and third lines, which are composed of contingents of maturer ages, and which it is impossible to provide with officers fully competent.

The most efficient troops are called upon to face the enemy in first line, and to carry the war outside the country. The others are charged with the duty of furnishing the garrisons of fortresses, guarding railways, and occupying the districts conquered; or they serve to replace casualties suffered by the actual field army, or by any other fighting troops. All must *at least* be able to delay an enemy's attack by local defence, and to fight the enemy as guerillas should he cross the frontiers.

The consequence of this general levy is that the military value of the armies is very much more than formerly dependent on the character and nature of the nations themselves. The more of the population are enrolled into the fighting army, the more the spirit of the troops thus composed will be determined by the physical power as well as by the political and social spirit of the nation itself. An army with a discipline handed down from generation to generation, recruited from a vigorous folk accustomed to obedience, which has learned to limit its desires for the good of the common weal, and at the same time is trained to hard work and in the profession of arms, will give quite a different account of its power of resistance against demoralizing influences, as well as against the sufferings, fatigues, and privations of a campaign, than the army of another nation, which is physically weakened, infected by revolutions, or disused to arms owing to increasing opulence. Sound political training, preservation and strengthening of the spirit of discipline and subordination, readiness to make sacrifices in the interest of the community, which constitute the really loyal spirit of a citizen, are the necessary conditions for carrying on successfully the war of masses in our age. Where, however, the recruits who enter the army are accustomed to resistance and insubordination against all authority, the mechanism of a modern army runs the grave risk of breaking down even under the pressure of conditions which by themselves alone would not be decisive.

This development entails the further and, perhaps, still more important consequence, that the political importance of war has completely altered. Owing to the fact that all classes of the nation are affected, and that personal sacrifices are imposed on each individual family, wars for frivolous or dynastic purposes become impossible. We can and must uphold only by force of arms really vital interests of the country. The resolve to go to war is also rendered very difficult to-day, because war affects most deeply every member of the community. The sacrifice in wealth and blood that must be exacted will probably surpass everything we have experienced hitherto; and the dangers of such enterprise, moreover, as well as the evil consequences of defeat in war, will be far greater than ever. Prussia's crushing defeat at Jena in 1806, and her rising in the memorable year of 1813, give us, perhaps, an idea of what the sacrifices will be in a modern war, and the oppression a nation will have to suffer in all likelihood should the war bring on defeat and with it the conquest of the country by the enemy. That France did not suffer in a similar way in 1870-71 is due to the broadminded humanity with which the Germans have conducted the war. But it is not at all certain that other people will manifest an equally high moral standard.

Preparation of war in peace costs, as it is, large sums, and claims a considerable portion of the national revenue. If we mobilize, the necessary expenditure rises enormously, as the army must be supplied and kept efficient. As most of the labour will be withdrawn at the same time from the market, and all means of living be stopped thereby, the whole domestic life must be shaken to the core, which will prove all the more calamitous the more we are unfortunate in our operations.

It has been asserted and seemingly substantiated scientifically, that no State could carry through a war at all, waged with the masses levied in our days. It would not only mean absolute domestic ruin, but war itself would be completely paralyzed by the want of means that could not fail to be felt soon after its outbreak; the economic strength for maintaining such huge armies would simply fail. For this reason alone a war of that nature between two civilized nations would become impossible.

I think this view is going much too far. It is in the nature of human things that they regulate themselves automatically as it were. Economic impossibilities do not crop up suddenly and all at once; they assert themselves gradually and exercise an irresistible and pressing influence on the affairs of the belligerents as well. Owing to the stress of the situation acting in a similar manner in both camps, the belligerents will be obliged to adapt themselves gradually to the existing possibilities, and to intervene by adjusting domestic matters. We can, for instance, hand over workmen to some industrial and agricultural concerns from the second and third lines, when they are not immediately wanted for military operations. The victor in the first decisive battles may be able to demobilize altogether the echelons in rear of the army the moment the danger of hostile invasion has passed. The vanquished will sue for peace all the more readily the more impossible it appears to him, from an economical point of view, to re-establish the balance of power upset by defeat. But where in an indecisive struggle the adversaries keep each other in check, the standard of their performances will be gradually lowered, and success will ultimately fall to him who can boast of the highest moral energy and self-sacrificing spirit, or, where on both sides the moral motives are of an equally high standard, can hold out financially longest to finish the war. In this way the factors ruling the conduct of war will automatically adapt themselves, as it were, to the economic conditions, and a compromise between what was intended and what was possible will of necessity be the result.

If we have thus established that especially an unfortunate war *must* entail far more disastrous economic consequences than ever before, and *may* lead to complete economic ruin, yet the inference that wars with modern armies could not be carried to the bitter end from reasons of economy is indeed not justified.

Two points of practical import result, however, from these comments. Firstly, the economic superiority of a nation forms by itself an essential factor for success, and the way a State manipulates its finances must have a far-reaching influence on the conduct of war. Secondly, all special preparations for war must be carried out with the greatest seriousness, with the utmost consistency, and *without false economy.* There can be no doubt that nowhere will half or insufficient measures be punished more severely than in the sphere of armaments. The losses entailed by an unfortunate war are *so* great, the venture of risking these losses by insufficient preparation is so dangerous that even the greatest sacrifices for armaments seem justified by themselves and under all circumstances.

From a purely military point of view, the growth of the armies, looking merely at their proportionate numbers, renders all military action much more difficult. This difficulty is already felt when training soldiers. In order to raise the masses required for war without increasing the cost of peace training unduly, the terms of service had to be reduced considerably in recent times. The training of each man must therefore be completed in a very much shorter time than formerly, and this imposes in consequence a much severer task on officers and non-commissioned officers. A very great amount of labour is moreover thrown on them by the fact that a very much greater absolute number of recruits passes through their hands than in the smaller armies of the past, and that the numerous trained men must be retrained again and again and kept permanently efficient. The consequence is that the strength of the trainers is taxed already to the utmost in peace time.

Another effect of these conditions with which we have to reckon is, that with the growing size of the armies the tactical worth of the troops is gradually decreasing, even that of the line. The greater the numbers which must be raised for war, and the more men must be therefore trained in peace, the more difficult it becomes to have available suitable officers and non-commissioned officers to train the men and to lead them. In war, moreover, the line will be weakened by having to detail officers and non-commissioned officers to new formations, and the more there are of these new formations, the more this will weaken the line. This must impair the steadiness of the troops, and evidently cause a moment to arrive when the advantage of numbers is no longer of any value as compared with the tactical worth of the troops. It is just this point which the latest wars bring forcibly home to us. The levies of the French Republic, in spite of their numerical superiority, were of no avail in 1870-71 against the firmly-knit battalions of the Germans; and the Japanese, in spite of the notorious numerical inferiority of their army, invariably defeated the numerically superior Russians. In this respect the American War of Secession is also exceedingly instructive. Again and again the numerically superior armies of the Union succumbed to the tactically and morally better trained forces of the Confederates.

The conduct of war itself is further aggravated by the masses of men. It will, in the first instance, prove exceedingly difficult to move the various armies, which together form a modern army, by a uniform idea, and to direct them in such a way as to ensure the participation of every portion in the main issue, without wasting forces in minor operations. But the difficulties also grow with the number of troops, from a technical point of view. Railway transport, and the systematic movement of very large masses, their provisioning, the necessity of keeping them permanently efficient, and, therefore, of providing for the constant supply of ammunition, the evacuation of wounded and sick, the pushing forward of the necessary drafts of men, horses, and material, the guarding of all important roads and lines of communication of the army, all these necessities present problems in the technical conduct of war which are very difficult to solve.

The enormous number of troops raised obliges us to select large areas for assembling them, and to make a thorough use of the network of roads within those spaces so as to be altogether able to bring to the front as large a number of troops as possible. The same consideration will often oblige us to march on each road as many troops as possible. The number of troops on each road is again limited by the possibility of supplying them, and by the necessity of bringing into action—though perhaps not on the same day—the rearmost troops before the fighting strength of those in front is exhausted. The necessity of provisioning the troops and of replacing armaments demands at once that on all lines of advance, stores of equipments and provisions must be collected, pushed forward, and issued to the troops without this mechanism being allowed to stop for a single day. The difficulty is enhanced when, owing to the number of troops, living on the country becomes impossible, and all the wants have to be brought up from the rear.

The strategic mobility of the large modern armies is, under these circumstances, palpably far inferior to that of smaller armies, which, at least, in a rich theatre of war that provides supplies without difficulty, could move with much greater freedom. It is, moreover, evident that a large army, with numerous march columns moving parallel with each other, needs more time for wheeling, concentrating, and deploying than a smaller one, and has to contend with greater difficulties of supply. Topographical obstacles, too, are manifestly more difficult to overcome by large masses than by smaller bodies. Owing to the clumsiness of all movements, and the time they take, all decisions of headquarters must be prepared long beforehand ; it is therefore impossible to make always constant use of the intelligence daily received about the enemy. This again obliges us to push reconnaissance very far ahead, so as to have as early as possible information about the enemy's measures. This increases the depth of the army on the march, and with depth grows the difficulty of operating. All these conditions must be thoroughly considered, if we wish to form a clear idea of modern warfare. Yet even they do not include all the difficulties of operating which arise from the number of troops alone.

In most cases, especially when we are obliged to fight against superior numbers of the enemy, we will have to apportion to the actual Field Army troops of the second line at least—therefore reserve formations in Germany. These will be inferior to the line troops in power of marching, as well as in discipline and fighting qualities. The men comprising them are still perfectly efficient physically at their age of from twenty-four to thirty years, but often no longer accustomed to particular military exertions. Nor can rapidly created new formations ever prove as thoroughly trained and stedfast as a body of troops firmly welded together in peace time. A standard infantry can only be created under modern conditions in war, and when facing the enemy. To raise cavalry reserve units to the same level as regiments of the line is altogether impossible, and new formations of artillery will but very gradually attain the same efficiency as a unit thoroughly trained and knit together in peace, and thoroughly practised in shooting and driving. Headquarters are therefore obliged to reckon already on the first decisive battles with troops of varying tactical value; and it would be a very grave mistake to disregard this fact in arranging matters, though the strategical employment of the troops is thereby rendered rather more difficult.

As regards tactics, very considerable difficulties assert themselves, also, in the employment of masses, which with smaller bodies do not exist at all, or to a less extent. The use of ground for tactical purposes has become very much more difficult for the huge armies of modern times, than was formerly the case, especially on the defensive. It is exceedingly difficult to find defensive positions suiting armies of some nine to twelve army corps, and favourable from a tactical point of view. In most cases we will have to include in the position, portions of ground affording no advantages to the defence at all, or, worse still, favouring the attack. With the mass of troops available, we can, of course, occupy the less favourable sections of the ground more strongly, and thus try to neutralize the disadvantages we have to take into the bargain; yet we must bear in mind that the advantage of the defensive, of being able to spare troops just on account of the ground when it is being occupied, is partly lost thereby, because we are then obliged to employ troops in passive defence, which, if the whole position had been better, we could have used for other purposes. A similar disadvantage asserts itself, also, in the tactical offensive. It will not always be easy to find spaces sufficiently favourable for deployment of the large numbers in the attack of modern armies. Often we shall be forced to deploy and to stake troops on unfavourable ground as well. But this disadvantage does not fall so heavily on the offensive, than would unfavourable ground on the defensive, since the attack, from its nature, must always deal with the fact that the choice of the position most advantageous to the defender is left to him.

In this way the modern armies of masses render the conduct of war difficult in many ways. But they themselves contain besides an element of danger that must not be underrated.

The mechanism of such an army is so enormous and complicated that it can only be kept going, and be directed, if all its parts work on the whole at least reliably, and if it is spared great and extensive moral shocks. We cannot, of course, count upon the fortunes of war keeping us free from manifestations of this kind, just as little as we can count upon being victorious in every action. These shocks can be got over if they are felt only locally. But when *large concentrated masses* are once out of hand, when panic has seized them, when supplies fail throughout, and the spirit of insubordination is rampant in those masses, they are not only powerless to resist the enemy, but become a positive danger to themselves and to their own commanders by breaking all bonds of discipline, upsetting the course of operations, and setting problems to the headquarters which are impossible for them to solve.

War conducted with large modern armies is therefore, in any case, a risky game, taxing to the utmost the resources of a State in men and money. Under such circumstances it is only natural, when measures are adopted everywhere to make it possible, should war break out, to finish it rapidly, and quickly relieve the tension which must arise when the whole nation is called to arms.

These efforts, together with the theoretical comprehension that it is as well to make, as much as possible effective use of all the existing forces at once, so as to make sure of success as far as it can be done, have caused arrangements to be made for the mobilization, immediately at the beginning of the war, of all the nation's fighting power, and for the strategetic concentration of as many troops for simultaneous action as space and other conditions will permit. From this it follows that at the outbreak of war, a great and unexampled contest of millions of men will take place, which will impress on modern war, in its initial stage at least, its special feature.

But we cannot assume at all that the conditions as they will result from the calling up of a whole nation's strength, and from strategetic concentration at the threatened frontier at the beginning of the war, will continue throughout its whole progress.

If in the Russo-Japanese War peculiar circumstances caused the armies to arrive in the theatre of war slowly and by degrees, and to grow constantly stronger in numbers as the struggle proceeded, it will probably be the reverse in a Central European War.

I have already pointed out that in the course of a long war the economic conditions must from physical necessity tend to reduce the employment of masses.

But there are some other reasons tending in the same direction.

There will first and foremost be the natural waste, which will very rapidly reduce the masses in the field. Apart from the losses in action, the waste in men was very great already in 1870-71. The loss by marching alone, until the first actions took place, was 8 to 9 per cent., and during the war the companies especially became greatly reduced, often to half, and even less, their full establishments. The waste was also great, of course, in the drafts that had come out. All this will no doubt be far worse in future. In the vast numbers called up we must be prepared to find inferior men as well. The losses the troops of the first line will suffer when marching are therefore sure to be greater than formerly; they will enormously swell when we must operate with troops of inferior quality. We must also reckon with the fact that some men of the older contingents of reserves, fathers of families, and politically unreliable subjects, will try, by some pretext or other, to escape service, and often so, perhaps successfully. In 1870-71 in France, during the second phase of the war, the republican authorities were frequently obliged to use the most stringent measures to get the men to serve. Large numbers will be therefore lost from this cause too. The course of the war will probably produce altogether similar effects. The physical efforts made at the very beginning of the war are so great, that it is scarcely possible to increase them, at least in countries like France, which raises its last men on the first day of mobilization. If such an army is victorious, the inducement for further great exertion ceases, but if the war takes an unfavourable course, it will often seem hopeless to continue it when the supply of men has been exhausted, and the tension that gave rise to raising the masses will then give way.

All these circumstances will probably cause the size of the armies to dwindle away rapidly after the first decisive battles, especially when the physical and moral strength of a people does not come up to the high demands a modern war exacts. The war of masses will thus undoubtedly lose much of the character peculiar to it during the progress of events. In the conduct of war itself, conditions are also likely to arise, giving a different stamp to the combats after the first great decisive battles. It is quite a different thing when two intact armies meet on equal terms at the frontier, or when one army victoriously invades the enemy's country, and the other, beaten, but fighting in its own country, retreats. The conditions under which the struggle is continued then change in many ways, as we shall discuss afterwards. The war of 1870-71 already took the course depicted here, though not in so clear a form as we may expect to see in future.

The reason for the small difference in character between the initial combats and those of a later period, we may attribute to two main causes. Firstly, the original concentration on the French, as well as on the German side, did not from the outset provide for one combined battle, but for preliminary fights in groups. The ultimate junction of these groups for united action was certainly planned by the Germans, and soon achieved by their First and Second Armies; but for all that, the troops were never led forward from a common base of concentration to fight a decisive battle together, if possible. The Third Army operated at first even in an opposite direction. The French had, we dare say, a uniform plan as well. In spite of their cordon-like and scattered dispositions, we may assume that an offensive in the direction of the valley of the River Main was contemplated, leading necessarily to the separation of North from South Germany, if successful. The German offensive prevented the execution of this plan; and the consequence was that the war was carried on from the beginning in groups independent of each other. Secondly, the nature of the preliminary actions, and of those afterwards, was probably due to the fact, that the numbers mobilized were not the maximum efforts of either State. The characteristic difference in the actions of both periods of the war was, in consequence, not so great as it will probably be in future. But for all that, the war up to the Battle of Gravelotte—St. Privat was quite different in nature strategically from what it was afterwards, and this points to the development we may expect in future.

The latest great war, the Russo-Japanese War, it is true, was of a character altogether different. From beginning to end it was a uniform struggle of two modern armies; yet we cannot accept this as a proof at all that matters will take a similar turn in future. The conditions were quite peculiar which forced upon it this uniform nature. The main forces of both contending armies were in this case tied to the only existing railway, because they were dependent on it for their supplies. That railway formed the clamp which kept both armies closely concentrated and obliged them on the whole to advance against each other frontally. But nothing justifies the assumption that in countries with an extensive railway net, permitting the use of different bases, things will be the same as in Manchuria. A critical examination of the conditions there will rather show that with greater freedom of movement affairs would probably have taken a different course in Eastern Asia as well.

If, for instance, after the battle of Liao-yang the Russians had given way with a portion of their forces excentrically, and been able to retire, perhaps, on a base in the west, it would have been of the utmost advantage to them. It would have secured them exterior lines, facilitated supplies, and effectively prevented envelopment, which latter they could have escaped, of course, as well, retiring as they did, if with their numerical superiority they had made proper dispositions at least of some kind. Such an operation would have constantly threatened the Japanese on their flank and obliged them to divide their forces as well, either to operate on divergent lines or to attempt enveloping the enemy by wide and badly-based turning movements. On the other hand, the Japanese would have been able to operate much more energetically and decisively, too, if both their armies on the flanks could have relied on railways.

The Russo-Japanese War is, therefore, in this respect no guide to us for the future. We must, rather, come to the final conclusion that, owing to the enormous size of the armies, a future war in Central Europe will be of a twofold nature. The *war at the time of concentration* will reveal the special features of a modern war with masses. The *operations afterwards*, however, which must result from the first great decisive battles, will be more like those we have witnessed hitherto. This latter period will be less distinguished by the special modern features due to the size of the combined forces in strategical and tactical operations, than by the achievements of modern military technics which will, of course, manifest their far-reaching influence also during, and immediately after, concentration for war. In addition to the effect of masses in future wars we must, therefore, also thoroughly investigate into these modern war appliances if we wish to gain a clear conception of the nature of the next war.

But before we turn to the description and examination of these mechanical appliances we must once more consider numbers in their all-important relation to force. Mass (numbers) and force are not identical. Force does not at all grow always in the same ratio as numbers. Between force and numbers there is, rather, a relation that often varies and depends on a variety of circumstances, demanding more than ever special consideration at this age of enormous armies.

CHAPTER II

FORCE AND NUMBERS

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When we were glancing at the inevitable consequences of calling up for war, in our days, the whole nation, we became aware of the fact that the masses themselves contained some elements of weakness, that they are sometimes even a kind of danger to our own conduct of war, but that nevertheless all States of Europe are dominated by the "rage du nombre," and that the general tendency is rather to increase the levies to the utmost limit of financial and personal capacity. There is no idea of stopping this for the time being. Numbers seem to the present generation the decisive factor in war.

The importance attributed to numbers in general by all Continental States of Europe is naturally based on the assumption that, taking armament, equipment, and recruiting as about equal, the efficiency of the various European Armies would be about equal, that we could consequently attain a distinct and tangible superiority only by superiority of numbers. We in Germany have, moreover, been accustomed during all these years of peace to deal only with theoretical factors, and, as a matter of fact, to disregard in consequence often those imponderable factors of success, which defy all calculation.

But this faith in numbers is a delusive idea. The experience of war at all times makes that clear, and nothing is more dangerous than to expect numerical superiority to do what it cannot perform by itself. The size of the armies employed is certainly one of the most decisive factors of force. Yet we must not overrate its importance. We must rather try to render to ourselves an exact account of the importance of numbers in war, if we do not wish to get on wrong tracks in the conduct of war itself.

For the theory of war, the notion of numbers is at first the only possible gauge we have for estimating force, and the only expression we have to represent it. Whenever it is a question of developing theoretical doctrine and principles for the conduct of war and the leading of troops, the imponderable factors of force must be supposed to be equal with the assumed adversaries, numbers remaining then as the only measurable difference. If, for instance, we want to compare the respective tactical merits and demerits of attack and defence, it is inadmissible to suppose one side to have less good troops or worse commanders than the other. The perfectly unreliable nature of such assumptions would never lead us in our appreciations to results that could be generally accepted, and we would never get beyond the discussion of some particular instance of an indefinite nature. But the practical soldier, when applying theory, must always remain aware that force is equal to numbers only in theory, and not at all so always in practice.

In actual warfare it is seldom permissible to look upon numbers as the only measure for estimating force. Yet among the various factors co-operating to produce force, numbers deserve to be duly and specially appreciated.

The numerical strength of an army is at first the only factor of force which can be ascertained for certain. All other components of this force can only be estimated, and are thus liable to deceive in an infinite variety of ways. Knowledge of the enemy's numerical strength gives us, for all that, some kind of safe guide for judging what we may expect he can do, if we add that knowledge to our estimation of his military qualities, weaknesses, and peculiarities. Indeed, this guide may become an absolutely safe one if we have become acquainted already, by experience of war, with the enemy's peculiarities and efficiency, and are therefore no longer dependent on mere guesswork. It was thus possible, for instance, on the German side, after the battles of Woerth and Spicheren, to get a precise idea of the high tactical worth of the French army, its mode of fighting, and want of initiative on the part of the leaders. If, in addition, exact intelligence was available about their numerical strength, German headquarters held a safe guide for determining the vital force of the enemy. Where, of course, the armies are composed of troops differing in value, their total numerical strength affords no safe guide for what the enemy is capable of doing. Yet we must remember that even troops of different value at the beginning of the campaign, let us say line troops and new formations, may during the war attain a certain amount of equality. The weaker and less efficient elements will gradually disappear from the ranks, owing to the fatigues and privations; death will have its due, taking away too often the best and most daring men; war experience is gained by all portions, and by degrees makes up for the deficiency in training. All these elements work together, to efface gradually the difference in the value of the troops. If once this stage is arrived at, if the enemy has become aware of this development by experience, his intelligence about numbers will again be to him the decisive factor for estimating the enemy's power.

The same, of course, holds good for our own troops too. If their qualities are so well known to their commander that he can form a correct estimate of them, numbers afford him the scale by which to measure the force he must stake in each individual case to ensure success. If we are altogether justified in assuming the value of the troops of both belligerent parties as perfectly equal, numbers will form the absolute gauge for what force we must use.

In the practical conduct of war, numbers will therefore always form one of the most essential factors in strategical calculations, and of success. Yet numerical superiority is not always the most important condition for success.

There are often occasions where superior numbers are of no avail. Even Bonaparte was unable to force the bridge of Arcole, because on the dam on which he proceeded to make his attack, he could not deploy his forces. Only the turning movement made the attack succeed, because there it was possible to use more troops. The Persians succumbed at Marathon because they were unable to deploy their tremendously superior numbers on the restricted field of battle ; the same seems to have occurred at Salamis. On the confined sheet of water the Persian fleet was unable to make efficient use of its forces.

In recent wars similar incidents occurred as well. When Bourbaki attacked the position on the Lisaine, he was altogether unable to deploy his forces on the comparatively narrow space he had selected for deploying for attack. Of the 326 guns he had brought with him he could only get 80 into position ; his infantry had no room for deploying their superior numbers ; and so he had to give in before the numerically weaker enemy ; and during his retreat his numerical strength brought some more disaster on him, because he was unable either to move, or supply in a proper manner the numbers he had.

As in these cases space was wanting for employing superior numbers, so conditions may arise where *time* makes it impossible for the numerically stronger party to concentrate superior masses at the proper moment. The Russo-Japanese War furnishes a striking example of this sort. In other cases again, it is the tactical and operative clumsiness of armies which makes it impossible for them to use their superior numbers effectively in the face of a more mobile and tactically better organized enemy. I need only point to the

Battle of Cannae, so ably traced by Field-Marshal Graf Schlieffen.* Besides, military history abounds with such examples.

Further, there may be situations in which large masses mean destruction owing to the flagrant disproportion existing between the numbers and the nature of the theatre of war. Poverty of the country and few roads mostly go together, because roads are not made arbitrarily, but originate from traffic of men and goods, and can only exist in proper proportion to this traffic. There may very well be cases where it is positively impossible to provision troops beyond a certain number, and to keep them efficient to fight and to move. The most telling example of this fact is furnished by Napoleon's campaign in 1812 in Russia, where the bulk of the army did not at all succumb to the rigours of a Russian winter, as legend will have it. It mostly perished during its advance, because, with a sparsely populated and roadless country, it was impossible to march the army divided, and supply it regularly. Then the hungry mass broke all bonds of discipline; the losses on the march grew enormously, and of the whole grand army, which, more than 300,000 strong at the beginning of the campaign, had begun its advance under the personal command of Napoleon, something like 123,000 men only reached the battlefield of Borodino, and only 90,000 Moscow. These remnants only perished from hunger and the cold during the retreat.

If in the cases mentioned, numbers were of no use owing to the peculiar and unfavourable conditions prevailing, we learn, on the other hand, from innumerable examples of military history, that even under the most favourable conditions for operating with, and deploying, troops, the advantage of superior numbers was neutralized by the superior military and moral worth of the numerically weaker party. The Romans conquered the world with inferior numbers; and we need only open the great book of Prussian history to become aware of this fact from our own glorious past.

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* "Vierteljahreshefte für Truppenführung und Heereskunde," 1909, vol. iv.

The moral worth of troops thus gains decisive importance in addition to numbers, and this, under the conditions of modern warfare, will weigh all the more heavily in the scale. The capability of modern troops to endure fatigues and fight with energy, and their moral strength under privations and disaster depend, under modern conditions, on many other things, and differ, therefore, much more from those prevailing at the time of professional armies, which contained in their ranks numerous old warriors, who had faced death a hundred times. Less than formerly must we, therefore, gauge to-day the efficiency of an army by numbers alone.

The immanent value of modern troops rests on national character, and on the system of service; on the moral and physical soundness of the men; on the training of man and horse; on armament and equipment; on the obedience to which the men have been educated; on the amount of self-reliance and initiative which is, nevertheless, developed in them; in no small measure, on the confidence the men have in their superiors; on the *esprit-de-corps* by which the troops are animated; and lastly, on the ready zeal and devotion which the personality of the commander knows how to rouse and to preserve. The power of an army further depends on the proficiency, intelligence, and heroism of the officers. This force can only be determined by its effects. The value of armies will therefore vary according to the general state of civilization of the nations, and their military institutions ; and so long as the national character and the state of culture of the nations, from which the armies spring, differ, as is still the case in Europe, we do not go wrong, in spite of the similarity of all military organization, in assuming that the various armies differ very much in their military efficiency.

At another place we have already pointed out, that even within one and the same army, the various categories of troops are of very different character, and that by filling up the cadres, existing in peace, with reserves on mobilization, the value of a unit may even be lowered.*

The strategist in the armchair does not, of course, like these things, and it is at any rate very much simpler in all military plans to operate with tactical units as if they were as equal as the pieces on the draughtboard, and not of different value. We would, in that case, have a fixed rule for estimating the power of an enemy, and could employ our own troops, not only indiscriminately, but could also augment them at will, so long as we have trained men, and money to last. But such a strategic calculation would hopelessly break down in the face of the stern realities of war; and to meet these successfully we must always reckon with the actual values; not *numbers* decide there, but *force.*

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* An instructive illustration of this fact is afforded by the Imperial French Army in 1870. Here, the reserves called up, often became a source of weakness, and brought the seeds of disintegration into the ranks of the well-disciplined peace-formations. The example of Lapasset's Brigade, belonging to the Fifth Corps, is in this respect especially characteristic. This brigade had joined the Second Corps, during the retreat from the Saar. Arrived in front of Metz the brigade commander asked to be allowed to hand over his reservists to the fortress garrison. He thought he could do better with the weaker peace establishments alone. His request was granted, and indeed it was this brigade which never budged an inch of ground, in spite of the most violent attacks of the Germans, whilst other French troops in less difficult situations were often much shaken in their morale.—Lapasset, 1817 to 1875, "Mémoires," 1900.

The elements, however, from which force originates, are almost all imponderable, and we can never succeed in expressing in a formula, universally applicable, the ratio that exists between force and numbers, and in fixing the limits, beyond which increase of force through increase of numbers will be neutralized by the elements of weakness, which under certain circumstances result from such increase of numbers. We can estimate only the ratio between force and numbers, because it rests on imponderable and ever-changing elements. But some points may be given which should never be lost sight of when determining this ratio in each single case.

We must first of all remember that the tactical increase of force, which we may hope to gain by reinforcements in numbers, vanishes if accompanied by strategic disadvantages which neutralize or even exceed this tactical increase of force. We can certainly never be too strong in battle, yet there may be situations where we must give up numbers in return for other advantages. This will be the case, for example, if the opportunity is propitious for acting rapidly, and would be lost, should we wait until the largest numbers possible are concentrated. The accumulation of troops may also impair their mobility and deployment to such an extent as to turn the tactical advantage aimed at into a positive disadvantage. Similar conditions may arise in many other ways.

We must, secondly, be clear on the point that numerical strength is only effective as such, if the troops employed are actually fit to do the work imposed on them. Nothing is more dangerous than basing strategical calculations on values, which may be there in numbers certainly, but are not efficient enough to comply with the demands exacted by strategy. Nowhere more than in war is it necessary to deal with realities only, and not to be deceived, or to be dazzled, or to be carried away by unjustifiable expectations through any semblance of force. Before the stern realities of war all sham passes away like false human greatness before the majesty of death, and only what there is of actual tactical, strategical, and moral forces will survive.

Lastly, we must never forget that the moral and mental factors of force are always the ruling factors, and, within certain limits—which in each case must be very differently defined according to special circumstances—are more important than the numerical factors. This goes even so far as to make the force of psychical impulses sometimes counterbalance almost completely all other defects, and the influence of one single great personality to raise to a marked degree the general level of efficiency of whole armies —nay, even of whole States.

It would be carrying coals to Newcastle for me to furnish special historical proofs for this assertion. In whatever form war has appeared, mental and psychical forces have proved far more decisive for success than mere numerical strength. This law is rooted in human nature, is therefore of general application, and is always anew confirmed by experience. Increase of numbers that is possible only at the cost of the tactical and moral value of the troops will rarely represent an actual increase of strength. On the other hand, when opposed to morally shaken or altogether inferior troops who scent danger in every quarter, numbers have in many cases almost no meaning at all. It is, then, only a question of playing on the enemy's imagination to paralyze his force completely.

If the greater efficiency of troops is thus a factor which to some extent may make up for inferiority in numbers, and, with equal numerical strength, represents a decisive superiority, we should think that, at least, with equally efficient troops on both sides, superior numbers under otherwise equal conditions should guarantee us victory at least in theory. Yet military history proves that it is not so.

The reason for this apparent inconsistency is very simple. The way of *conducting* war it is which gives victory to the one or the other party. By the advantages of natural or artificially prepared ground, by the greater advantages he may derive from his armaments, and by other circumstances, forces accrue to the defender, which sometimes suffice to establish his superiority over the enemy; the assailant tries to gain superiority by the advantages inherent in the initiative and in offensive tactics. By this means he may succeed in defeating portions of the enemy's forces before the latter can concentrate them all against him, and in becoming by this local victory the numerically stronger party. The superiority which one or the other side may thus obtain, may and can be even so pronounced as to compensate for the original inferiority, and thus procure for the weaker army, supposing the troops to be equally efficient, the possibility of conquering the stronger enemy. But for such success we must always presume superior *leadership*, which can change almost everything to its favour. Here again we are confronted by an entirely imponderable power. It will never be possible to determine what the effect of this power will be in each case. The increase of force produced by the absolute confidence of the troops in their leaders; the terror spread by a great name; the elasticity of genius in the moment of danger; and the importance of ingenious plans of operation positively defy all calculation. But when we see generals, who are not equal to their task, bring to nought the best performances of troops and the effect of greatly superior numbers; when, on the other hand, we notice the successes gained by great captains against overwhelming odds, no room is left for doubt that great generalship is of decisive importance, and that it can make up for greatly superior numbers of the enemy.

Yet experience and theoretical considerations show again that the most ingenious generalship is bound to fail when opposed to superior numbers that exceed a certain limit; that numbers, when they can act as such and are large enough, can neutralize all mental and moral superiority; that an equalization of numbers by genius is, after all, only possible within certain limits, and that a certain amount of numerical superiority is simply crushing, physically.

There is, therefore, a certain relation between the importance of numbers and the effect of great generalship; a law which determines the possibility of success. This law it must be possible to ascertain theoretically, as well as to deduce and prove it from experience.

Two means, we have seen, a commander has to get the better of even a stronger enemy. He can, by making clever use of the tactical advantages of the defensive, or by some successful offensive action, inflict such losses on the enemy as to neutralize thereby his superior numbers, or, at least, their efficient employment. If we start from this fact, we necessarily arrive at the following result: A general may neutralize the superiority of an enemy, if the proportionate numerical strength on both sides leaves any chance at all of inflicting on the enemy, one way or the other, losses large enough to neutralize his superiority. But if the numerical superiority of the one party is so great as to preclude the weaker party from decisively affecting, even by possible successes in the tactical defensive or by successful offensive actions, the total effect of the enemy's numbers, then no generalship avails to neutralize the effect of such superiority.

This is the most essential law of numbers.

The idea that there must be such a law is, moreover, not a new one; it has been expressed already in the eighteenth century. The repeated victories of Frederic the Great over far superior forces probably gave special occasion for more closely examining the relation existing between the numerical strength of an army and success. But as they started from altogether arbitrary and limited notions about war, this investigation led to one-sided and entirely wrong opinions. Under the descendants of the great king, the art of war lost itself more and more in conventional forms through adhering to the narrow standpoint of linear tactics. It lost all appreciation of the true elements of force, and thought to perceive in the form of tactics the real secret of success. The same intellectual tendency also caused strategy to overrate the purely formal geometrical principles, which were bound to come in conflict with the truth of things. It was thought that the decisive element was the situation of the base with reference to the army, and the geometrical direction of the lines of operation with regard to the enemy. They also came to the conclusion that a definite strength of the army would be best for all purposes. The size of the army, they thought, should make it possible to place oneself always in the correct geometrical position with regard to the enemy and to our own base, and, on the battlefield, to manœuvre the troops uniformly in drilling fashion, as it were in definite forms, on the execution of which it was thought victory would depend. As a result of such reasoning 30,000 men were declared to be the normal strength of an army ; considerably stronger armies were thought to be unsuitable, because they could not be moved strategically and tactically by the same principles. These views never prevailed, of course, in this extreme fashion, but they still got such a hold on the minds of men as to make them altogether underrate numerical strength. Even in her war against Napoleon in 1806 Prussia thought it unnecessary to call up all the forces of the State; and when General Rüchel reached the battlefield of Jena with his weak corps he unhesitatingly attacked the victorious French army. He expected victory from the deployment *en éventail.*

Of course, it was only possible to arrive at such absolutely wrong notions owing to the fact that the mode of warfare, as deduced from the wrongly interpreted lessons of the Seven Years' War, was the only form of war at all justified, and containing a principle superior and more decisive than any other. However much mistaken these views might have been, which mere theory had developed, they contained the idea, perfectly correct in itself, that under certain conditions the whole mass of an army cannot be brought into play at all, and that a minority would then be able to conquer; but that this minority must have, again, a certain strength to gain a decisive and ultimate victory.

This doctrine, resulting from purely theoretical considerations, is fully confirmed by the military history of all times. Some of the best known events of war are well adapted to illustrate this further.

When Frederic the Great was facing the French in Thuringia in 1757, he was well aware of his forces being inadequate to attack the superior enemy with any chance of success, if the latter could bring to bear his full force on him, and, at the same time, was in a position to make full use of the advantages of the defensive. The king, therefore, waited for the moment which would give him the chance to attack without having to fight the superior numbers of the enemy's army; and when this moment arrived he seized it like lightning. In deep columns the hostile army started to make an enveloping attack. It intended to gain the Prussian left flank, then wheel in, and, with all its forces deployed, to fall upon the weak enemy, enveloping him. But the king anticipated his enemy. Covered by the Janus hill the king moved on the inner line, cutting the path of the enemy, and in turn fell now with his whole force on the heads of the hostile columns. Here, where he attacked, he was superior in numbers and force, and had the start in deploying. The foremost bodies of the hostile army had been beaten before those in rear were able to deploy, and were thrown on those who followed. In this way the king always fought in superior numbers, and the actual numerical superiority of the enemy had no chance at all of becoming effective.

King Frederic acted similarly at Leuthen. By falling upon the left wing of the enemy in superior force he deprived the rest of the enemy's front of the chance of acting. The Austrian army was obliged to change front to the flank, so as to be able at all to use its superior numbers. This manœuvre scarcely succeeded, and when the new front was established to some extent—but certainly without the chance of throwing into the scale the full fighting strength of the troops—the left wing was already thoroughly beaten, and the crowds congesting the new front proved unfit to stay the victor. The numerically much weaker army was fighting everywhere with superior effect of arms and with superior numbers.

Nothing the enemy did, or could do, availed to change the situation created by this initial success.

In the same spirit Lee conquered in the heroic battle of Chancellorsville on May 2 and 3, 1863. The far superior enemy was standing in a strongly entrenched position at Fairview and Chancellorsville. By a bold and risky flank march, covered by woods, General Jackson turned the right of the Northern States' army with a portion of Lee's troops, Lee himself remaining to face the enemy in front. Attacking by surprise in flank, the turning force completely routed the right wing of the army, thus initiating one of the most brilliant victories the Confederates ever gained, while Lee pinned the enemy to his ground by partial attacks in front. Here, too, one army succeeded in obtaining local superiority by a bold stroke at the decisive point, in completely paralyzing a large portion of the hostile army, and in beating the part assaulted so thoroughly as to preclude this success being all the less counterbalanced by any other enterprise, since view and freedom of movement of the superior defenders were altogether restricted in the wooded country.

When we see here the numerical superiority of the enemy crushed by local victories in the attack, we have in the battle of Fredericksburg on December 13, 1862, an example to show how a like success may be gained by a clever use of the defence, with all its advantages. Such examples are rare, because defensive battles, especially of the weaker enemy, are mostly lost, from reasons I intend to explain in another chapter. The army of the Union under Burnside was standing about 115,000 strong at Falmouth and Fredericksburg; opposite him was Lee, whose army was weaker by about a third. The Rappahannock separated both adversaries. A frontal attack across the river was very risky for both parties. But Lee had posted himself so cleverly as to leave the passages, so to say, open to the enemy. General Burnside's artillery widely commanded the opposite bank; the construction of bridges and the crossing could be effected outside the sphere of the enemy's action. This seems to have induced Burnside to venture upon the attack, which was a pure frontal attack that came to grief in bloody actions before the fortified lines of the Confederates, and ended with a severe defeat which restored the balance of power, and afforded Lee the opportunity of assuming the offensive himself.

Not only in tactics, as here, but also in strategic operations, nay, even in the highest spheres of political strategy, the same law holds good.

When Frederic the Great proceeded to attack Saxony and Austria, in 1756, he was perfectly aware of his forces being inadequate to match the combined forces of his enemies; but he could hope that, by a rapid local victory over the enemy nearest to him, he might to some extent make up for the disparity in numbers, and that then the other adversaries, being less urged by political motives, would not risk a war at all, or feel not strong enough to declare and carry it through successfully single-handed. As he saw every chance of gaining such a first local victory, his enterprise was not only justified politically, but also from a military point of view; and his reckoning would have probably been right, if he had won the battle of Kolin.

Having lost it, France and Russia intervened in the war, and then arose that gigantic struggle where Frederic over and over again acted by the same law, and, by repeated local victories, finally—favoured, it is true, partly by political constellations—forced his adversaries to lay down arms.

The great captain of the French Revolution may be cited as a similar example. Especially in his first campaigns in 1796, the ever-victorious Corsican repeatedly succeeded in overpowering, by local victories, far superior forces of the enemy with an army that at first had been totally neglected. By seizing his opportunity when his enemies were separated, he, with his concentrated forces, first defeated one group of the enemy, and then turned round to defeat, with the same force, the other group. His enemies never succeeded in uniting their forces against him; but the portions first defeated represented such a large fraction of their whole available force, that by their defeat the original superiority was lost.

The latest wars show the same law. The Japanese were surely perfectly clear on the point, when they attacked Russia at the beginning of 1904, that all the military forces of the Tzar were many times superior to their own. But there was doubtless the chance of gaining over those forces of the enemy, which could be employed within a measurable time, victories which were bound to shake the whole edifice of Russian power to its foundation, and make the enemy inclined to conclude peace. We know the events proved this reckoning correct.

All the examples cited clearly show us the law of numbers in a positive sense. The numerically weaker conquers because he is strong enough to beat such a large portion of the enemy's forces locally in attack, or to weaken the stronger adversary materially and morally in the defence, to such an extent as will counterbalance, by the one way or the other, the original disparity in numbers.

Military history, however, shows us also that this law cannot be infringed without punishment. When Napoleon, who so often and so brilliantly had beaten superior numbers with weaker bodies, wanted to enforce victory with an army so much weaker than those of his enemies that even the most famous local victories could no longer change their proportionate numbers, he succumbed, and was bound to succumb.

We have convincing proof of it in the campaign of 1814. Napoleon turned against the Silesian army which was marching in separate columns, dealing it crushing blows and driving it back with heavy losses. But this success was not enough to restore, even to some extent, the balance of the total forces ; and when this victorious general went in turn for the main army of the Allies, he succumbed in the face of the enemy's masses, though they were used even with little energy.

A similar thing happened in the American War of Secession. For a long time General Lee, the ingenious leader of the Southern army, was constantly able to restore the balance of force by local victories, gained on the inner line over the numerically far superior enemy, reducing the latter's superiority over and over again. But his resources declined ; all the vital communications of the Southern States were gradually cut off, making the superiority of the North so overwhelming that no local victory could any longer reduce it, and no local defence make up for it. And thus the valiant band of heroes of the Southern States was ultimately obliged to surrender its arms, which it had so chivalrously wielded, before a positively crushing superiority.

Though we see the law of numbers asserting itself by degrees only in this war, the enterprise of the Danes in 1864 to fight Prussia and Austria was, from a purely military point of view, hopeless from the beginning. No local victory of the Danish army, no use of the defensive, had it been ever so cleverly and bravely carried out, could have changed in any way the proportion of all the forces. Military success was by itself unthinkable, and the expected political turn of affairs did not come about.

The conditions were similar with the Boers when they began their fight for independence. Considered from a purely military point of view, this enterprise was not justified, as it did not promise final success. It was evident that the total forces of the British Empire were many times superior to the military forces of both the Boer Republics. Deception on this point was impossible. Final victory could only be obtained, and the independence of the Boer States as such could only be preserved, if the Boers, by brilliant initial victories, had succeeded in bringing other enemies into the field against all-powerful England, which would have made it impossible for her to stake sufficient forces in South Africa. As the hopes entertained on this point failed, the fate of the Boers was sealed; they were bound to succumb simply by the law of numbers the moment the English actually determined to send to

South Africa the masses which could be made available.

This cognition is deeply tragic; and it was this tragedy that was deeply felt by the German people at the time the Boers had to submit. It would be wretched to deny this fact to-day out of regard for mighty England. The capitulation of Lee, too, after so many brilliant and heroic deeds, can only be looked upon as a deeply tragic event, though in the end it has perhaps turned out a blessing for the American people. Legitimate spirit of freedom and the most self-sacrificing heroic courage are bound to fail in the face of the mechanical, almost purely physical, weight of numbers. No genius can conquer brute force.

But over this tragedy we must not forget that the law of numbers teaches also a positive doctrine.

If it shows us, on the one side, the limits which even genius and its inspiring strength cannot transgress in this life without being wrecked; it shows us, on the other, how much even a limited force may achieve by elasticity of mind. By this law success, at least within certain limits, is no longer at the mercy of purely material forces; Napoleon's dictum proves false—that victory is on the side of the big battalions; the mechanical superiority of numbers does not reign supreme; genius of leadership, superiority of mental and moral forces will come to their due so long as they do not strive after the impossible; a bold and clear-sighted policy may look forward to well-deserved success.

This holds good for our German Fatherland as well. If at some future time Germany is involved in the slowly threatening war, she need not recoil before the numerical superiority of her enemies. But so far as human nature is able to tell, she can only rely on being successful if she is resolutely determined to break the superiority of her enemies by a victory over one or the other of them before their total strength can come into action, and if she prepares for war to that effect, and acts at the decisive moment in *that* spirit which made the great Prussian king once seize the sword against a world in arms.

CHAPTER III

THE MODERN ARMS AND MEANS OF DEFENCE

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After having attempted to reduce the importance of numbers to its true value, and give force its due with regard to numbers, we must now cast a glance at the military appliances by which the human mind has been unceasingly endeavouring to enhance force by pressing into its service the blind forces of Nature.

Among the mechanical achievements of our age, modern arms rank first, because they directly affect fighting. They must be considered first. But it would not answer my purpose if I gave a complete survey of the present state of armaments in the different armies. I must leave that to expert knowledge in each particular branch. For me, it is a question of tracing the influence of arms on the conduct of war. I therefore need allude to technics only in so far as it is necessary to understand tactics.

The infantry being always the decisive arm, its armament is above all of the greatest importance. This is shown in all wars by the fact that the losses caused by infantry fire are always considerably higher than those through other arms. Especially was this the case again in the latest wars, which have been fought already with modern rifles and guns.

The efficiency of infantry arms in the different armies is approximately the same since the small calibre of 6 to 8 mm. has been adopted everywhere. Their rapidity of fire is great. About twenty rounds can be fired per minute. In compliance with its range, the sights of almost every new weapon are provided with a scale of 2,000 metres. Most armies use the modern pointed projectile. Differences in armaments, which might affect tactics, do not exist anywhere. The German rifle, in particular, may be said to be a good one in every respect. It altogether comes up to modern requirements. Its ballistic efficiency, rapidity and accuracy of fire are good. Its construction is simple and serviceable. Somewhat behind time is, perhaps, the French Lebel rifle, which, in addition to other defects, has still its magazine along and underneath the barrel, whilst all other armies have introduced centre-magazines. Consequently, they are in France seriously engaged with the question of re-arming their infantry, hoping to gain thereby a start, especially over Germany.

For all that, with the adoption of small calibre and clip-magazine, as well as with the introduction of smokeless powder, and of pointed projectiles, the development seems to have reached a certain climax, and to have come to a finish for the time being.

Some States, it is true, are considering whether the time has not come for adopting an automatic rifle, which would allow of a very much greater rapidity of fire. Trials have shown that up to 100 rounds per minute can be fired with such a rifle, which at the present moment is actually being introduced in Mexico. France and England are hard at work constructing a similar weapon. In both these States the requirements to be fulfilled by this kind of arm have been made known officially, proclaiming thus a public competition, as it were. France seems to be nearer the solution of this problem than England. Commandant Chauchat has invented a machine-rifle ("fusil mitrailleuse") weighing but 8 kilograms, and enabling one man to fire 200 to 300 rounds per minute. Efforts are being made to construct from this model an infantry rifle not exceeding 4 kilograms in weight. An armourer of the small arms factory at St. Etienne is said to have already produced such a weapon which, with a calibre of 6·5 mm., comes up to all requirements. It is not known whether it has a chance of being adopted. Trials are, at any rate, pushed forward vigorously, and we may be sure of France introducing a new rifle at no distant date, an automatic rifle, or one with magazine case.*

The most material influence exercised by the improvement of infantry rifles, is the dissolving effect produced on infantry formations in action.

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* *La France Militaire*, No. 7,851, January 25, 1910.

Under modern conditions, closed bodies of infantry cannot expose themselves to rifle fire even at distant ranges, say 2,000 metres, without suffering most serious losses. As soon, therefore, as there is a chance of coming under fire, the infantry must unfold for action, so as to pass quickly into extended order the moment the enemy's fire begins to tell. All further manœuvring is then out of the question; forwards or backwards is here the only thing permissible and possible. The troops can only fight in single rank in loose skirmishing lines. Circumstances, ground, the enemy's fire, and our own intentions determine the intervals between the skirmishers. Within effective range, infantry can only advance by rushes or crawling, making at the same time the best possible use of the ground. Efforts will be made in most cases to decide the fire action at the medium ranges of 1,000 or 800 metres. It is not likely that on open ground we can approach the enemy's position closer than this before his fire has been at least partly fought down or subdued.

The character of fighting has altogether changed through all this. While it was formerly a question of leading the men forward in more or less closed bodies, under the direct control of their officers, with a portion only of the men extended in skirmishing lines or swarms, all the fighting troops now move in extended order, where each man fights and acts individually. Officers can no longer assert a direct influence, as formerly; the greater noise during an action renders it more difficult for orders to be heard. Often the few officers left can only act by their example during the action itself. The supports as well are obliged to advance over open ground in extended order, and can no longer follow the firing line so closely as formerly, because the dangerous zones behind that line have very much increased, owing to the flatness of trajectories, and because the shrapnel fire directed against the foremost fighting line forces the supports to keep at a proper distance, if they do not wish to suffer unduly without being able to inflict any damage themselves. On that account all distances in action have increased.

Through the introduction of an automatic rifle, effect of fire, it is true, would probably be increased; but many disadvantages would result therefrom. The new weapon would allow an overwhelming mass of projectiles to be hurled upon the enemy in the shortest possible time at a given moment in action; the physical labour of the men when firing would be reduced. On the other hand, a great deal more ammunition would be spent, of course, and there would be greater danger of wasting ammunition than there is now. The question further arises whether it will be possible for the men to carry sufficient ammunition in attack to take full advantage of the rifle. Should these rifles carry still further than the best of our present rifles, the troops will probably have to unfold for action earlier than to-day. But it is scarcely likely that the foremost fighting line will have to extend in yet looser formation. The limits at all compatible with an orderly conduct of the fight have been reached as regards that point. I do not believe, on the whole, that the introduction of automatic rifles would cause tactics to change appreciably. Without doubt it would benefit the defence in the first instance.

Nor is another new invention likely to affect tactics. It is the so-called "flame-killer," a material manufactured in the form of powder, which, added to the charge, does away with the flash at the muzzle without impairing accuracy of fire.

Infantry fire is very much enhanced by machine guns which, with ballistic properties equal to those of the modern infantry rifle, can deliver 600 rounds per minute, the gun being at the same time designed to sweep with its fire a certain frontage of the target by means of a slowly acting traversing arrangement for the barrel.

The effect of these guns at known ranges against low targets is very destructive when the gun is carefully served. But when the range is wrongly estimated, or the gun is improperly served, fire effect is very much impaired, the cone of dispersion being much shallower than that of infantry fire, where the individual marksmen commit manifold errors in aiming and firing, and thus cause a greater depth of the cone even when the range is known. But with machine-gun fire the error committed by the gun is always the same for each projectile, and the cone is therefore very shallow. Chance hits, as with infantry fire, are nearly impossible. By providing machine-guns with telescope sights it was thought better aiming could be insured; but the vibration of the gun when fired renders the use of that appliance difficult. Hoses have been introduced to carry off the steam generated by the water in the cooling apparatus when the gun is fired rapidly, so as to prevent the steam from being seen, making it thus more difficult for the enemy to range on the guns in action.

The efficiency of the machine-guns in use to-day and adopted by the different armies is approximately everywhere the same. Germany has adopted Maxim's system with hoses for steam exhaust, like most of the other great armies. Telescope sights are not used. France attaches great value to equipping the army with machine guns. She has procured large numbers of them, and apparently tries by these means to make up for her shortness in infantry, which she can no longer increase owing to the numbers of her population. She has adopted Hotchkiss' and Puteaux' systems. The latter system is said to be undergoing improvements which raise the rapidity of fire from 600 to 800 rounds per minute. France takes also an interest in the construction of light machine-guns in the form of a rifle like that of Chauchat, which I have mentioned. England, it is said, has resolved upon the introduction of a similar rifle as well. For the moment the British Army is equipped with Maxim and Colt machine-guns. Two guns are attached to each battalion, and six to a cavalry brigade. Austria has adopted for the field army Schwarzlose's, and for fortress warfare Skoda's machine-guns. The other great military powers are equipped with Maxim guns, partly apportioned to infantry and partly to cavalry to raise their fire-force. The mode of transporting the guns depends on the method in which they are intended to be used, and varies in the different armies. The guns are partly carried on pack animals and partly on waggons, whence they are placed for firing on a sledge or gun-carriage. If need be, they can be fired straight from the transport waggon, or the gun-carriage is at the same time used as the means of transport. Experience alone can tell which of the patterns are the most useful.

It can scarcely be doubted that the machine guns, especially when used in numbers, will exercise a certain amount of influence on tactics. If these guns are to co-operate with infantry in action, the latter will somewhat have to look after that auxiliary arm, the employment of which depends so much on special circumstances. There is a risk then, especially in the attack, of infantry regulating its advance too much by the machine-guns, and losing thereby its freedom of action. I shall discuss this more minutely in a later chapter.

The weapons of field artillery have developed as rapidly as those of infantry. The effect of this arm has enormously increased since our last wars. The ballistic properties have been considerably improved since 1870-71, and the ranges have materially lengthened. Through the use of smokeless powder the possibilities of the effect of artillery and, through the adoption of new guns and projectiles, the nature of this effect, have been greatly enhanced. Shrapnel shell is used in addition to common shell. The effect of both kinds of these projectiles has greatly increased. In addition, combined projectiles are lately being introduced, which can act as common shell or as shrapnel shell. It is anticipated that this kind of universal shell, or composite projectile, will be adopted by all armies within measurable time. By the fuse-setting apparatus the setting of fuses for the different ranges is rendered easier and more rapid ; it does away, at the same time, with a source of inaccuracy due to setting the fuse by hand. A mechanical time fuse, with clockwork that starts on a round being fired, is designed to diminish the irregularities in the acting of the time fuse, and to lengthen the shrapnel range. But this invention has so far not been adopted anywhere. Through the introduction of guns with their barrels recoiling, rapidity of fire is, however, very materially increased, because the rough corrections, at least, for relaying the gun approximately after each round, are done away with. By the use of shields the gunners are pretty fairly, though not perfectly, protected against fire from shrapnel and infantry. The rapidity and accuracy of fire is further affected very advantageously by the improvements in the apparatuses for laying the guns. The independent line of sight allows a division of labour between two gunners, thus facilitating and accelerating laying, especially for searching fire. The telescope sight makes it easier for the layer to see clearly and aim accurately at the target, in spite of the long ranges at which artillery is firing to-day ; this, again, reacts favourably on the accuracy of fire. The hinged stereo-telescope, owing to its optical properties and its fixed stand, makes it possible to find out and clearly trace in detail even targets otherwise difficult to see on the ground ; it allows, moreover, the effect of fire to be well observed by those who fire.

In addition to guns, which held the field alone for some time, howitzers have recently been introduced again. The necessity of destroying the enemy's field entrenchments and hitting targets behind cover has brought this about. These guns are apportioned to the field troops as light and heavy field howitzers. The former have calibres of 9·5 to 10·5 centimetres, and the latter of 12 to 15·5 centimetres. Both have automatic recoil and protective shields, and can be used for direct as well as for high angle fire.

The heavy howitzers, to which everybody attaches great importance, use direct fire against solid upright targets like walls, buildings, entanglements, etc., with ordinary common or high explosive shells, and against shield batteries and living targets with common shell or shrapnel. Opinions differ on the use of the latter. We have not introduced them in Germany. But elsewhere, shrapnel has many friends, chiefly for sweeping and searching targets under cover and not exactly located. For all that, most artilleries reject them owing to the undue amount of ammunition required to produce any effect. For this reason neither is common shell used, as a rule, for sweeping and searching, the heavy howitzers being solely employed against targets in the open and *close* behind cover, recognized as such. The light howitzers are used for direct fire like the field guns, but, with their steeper trajectory they are better suited than the guns for indirect fire or against targets behind cover. Both kinds of howitzers use high angle fire against field entrenchments with overhead cover. Common shell is used in that case, with retarded percussion action, so as to cause explosion only after cutting through the cover. The German light field howitzer has the defect of being without fixed ammunition, as is now common with guns; that is to say, it has no ammunition where projectile and charge form one single body. The fact, that with high angle fire different charges are used for different ranges, has caused the charges to be made up in different sizes, according to wants, and to be kept separate from the projectile. But the clumsiness of this method has induced some of the Great Powers to adopt fixed ammunition for howitzers also, by so-called "slip-on cartridges."

The advantages of fixed ammunition are known. They are: Greater rapidity of loading, simpler storage in the waggons, disuse of cartridge boxes or frames whereby weight is saved, simplification of ammunition supply, and combustion being effected always within the same space. Another and especially important advantage attaches to fixed ammunition, with howitzers in particular.

With divided ammunition the charge does not reach up to the projectile in the barrel. It, therefore, frequently happens that a badly inserted projectile slides back when the gun is laid at high elevation, causing thereby the combustion chamber to be reduced. The consequence is, that great irregularities in the explosive force of the powder occur, and thus greater dispersion. The slip-on cartridge avoids this defect, as it reaches with its front edge up to the driving band of the projectile. It should be, therefore, used with howitzers as a matter of principle, and it will not be long before it is also adopted in Germany.

Of decisive importance for the tactical employment of artillery is, lastly, the development of indirect fire, which, owing to the modern means of laying guns, can be manipulated with great certainty, so long as the commander is able to watch the target. The artillery can thus be effective without laying itself open to fire that can be observed. The gun is laid with the help of auxiliary aiming points. So much importance was attached in France to this kind of fire, that the guns always fired indirectly, as a matter of principle, using auxiliary aiming points (*point de répérage*). But the new Artillery Regulations of autumn, 1910, have abandoned this extreme view.

When firing from covered positions the fire is watched from observation ladders, carried as a rule on observation wagons, and provided, if need be, with protective shields, or it is watched from points in the country, from which the targets can be seen, and which can be connected with the firing battery, if necessary, by telephone, for the transmission of the commander's orders. Laying for indirect fire is facilitated by the panorama telescope, which allows an unlimited and direct use of auxiliary aiming points.

Lastly, we must mention the quick-firing guns of small calibre, which, with a bore of 3·7 centimetres, and similar diameters can fire about 300 rounds per minute, and are effective even up to 5,000 metres. In the South African war, these so-called pom-poms proved of great service, so much so that the English cavalry was supplied with them after peace was concluded.* The great mobility of these guns, the ease with which their fire can be observed, and the rapidity with which a certain amount of effect can be obtained, make them seem an arm especially useful for cavalry. But for all that, they did not find favour with the German army.

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* Have been withdrawn since.—TRANSLATOR.

The field army of the German Empire is equipped with a 7·7 centimetre quick-firing gun. It is surpassed in many ways by more recent patterns, yet it comes up to the tactical requirements. Its movability and mobility are, at any rate, excellent. It is equipped with time-shrapnel for 5,000 metres range, giving a forward effect of 300 metres for the cone of fire at the most favourable ranges; and with common shell that can be used also with time fuse; but the use of common shell with time fuse is effective only when the bursting point is in a distinct position with regard to the target; the common shell with time fuse is therefore not a particularly serviceable projectile. No other State, for that reason, uses common shell with time fuse. But the range of shrapnel has been increased to 6,000 metres and more, by almost all other nations. The Japanese are even said to have attained a range of 7,500 metres for time-shrapnel. The independent line of sight, which Germany has not yet adopted, is being used already in various other armies (France, England, Turkey, Italy, partly in Russia, Belgium, and others).

Besides, with guns, the German artillery is equipped with light quick-firing field howitzers, fit to be used for direct as well as for high-angle fire, and thus able to cut through strong overhead cover of field entrenchments. Its shrapnel has the same range as that of the guns with slighter effect in depth. This howitzer fires a newly-constructed composite projectile (05), which can be either used as common shell or as shrapnel shell. As common shell with time fuse, it is more effective against targets behind cover when the bursting point is correctly situated, than the common shell of guns; and for percussion shell, it contains a contrivance for setting the percussion fuse "with delay."

Owing to the larger calibre (10·5 centimetres) each round of a howitzer is more effective than one from a gun. But this difference is counterbalanced by the greater rapidity of fire from guns, and by the fact that the howitzer batteries carry less ammunition than the gun batteries. The greater number of light projectiles gives more chances of hitting when sweeping and searching than the smaller number of heavy projectiles. The replenishing and supply of ammunition is also affected by the difference in calibre; on the other hand, owing to the adoption of a universal projectile, the preparedness of howitzer batteries for any kind of fire is materially increased.

The German heavy 15 centimetre quick-firing field howitzer can cut through the strongest overhead cover of field entrenchments, and fight down in a very short time field artillery recognized as such, and under observation. It uses only common shell with percussion fuse, with or without retardation for high angle fire. Its explosive and detonating force is very great, and therefore likely to shake the morale of troops, even if there is not much actual damage done to materiél or personnel. But the heavy field howitzers are no good against permanent or provisional works. If the field army is to deal with them, heavier guns must be apportioned to it. Even the 21 centimetre mortar, with which the German heavy artillery is equipped for that purpose, and which is going to be replaced by an improved type of the same calibre, may sometimes prove insufficient. So it will be necessary to introduce still larger calibres. Such a gun, a 25 centimetre howitzer on gun-carriage, has already been constructed by Krupp, as we see from *Loebell's Annual* of 1910.

Long guns of large calibre, designed more for fortress and siege warfare, can also be attached to the heavy artillery of the field army for special purposes. They are the 10 and 13 centimetre guns of latest design. The latter ranges up to 12,000 metres and more, and by its far-reaching and effective shrapnel fire, may sometimes be of great use for enfilading the enemy's approaches, searching the ground in rear, and similar objects.

To be complete, I may yet mention that the 13 centimetre gun and the 21 centimetre mortar of recent construction are provided with a contrivance, by which means the guns need not be fired from platforms, and can traverse unfavourable ground such as soft ground and marshy meadows, and use country roads.

For service in the colonies, the German army is equipped with 7·5 centimetre mountain guns; these, as well as their ammunition waggons, can be taken to pieces and carried by pack animals; these guns fulfil all that is required of them for the special object for which they are designed.

The field artilleries of the great European States with which we are concerned, differ from ours in some details. But these differences are not great enough to affect tactics seriously.

The French 7·5 centimetre gun is ballistically superior to the German, and steadier when fired ; but then, it is much heavier, which is rather serious for horse artillery in particular, as it cannot follow cavalry everywhere at a rapid pace. Nor do the shields afford the same amount of cover as the German shields. Rapid changes of direction are difficult to carry out in battery, because the guns when firing are anchored, and often sink deep into the ground. The very flat trajectory is, moreover, little effective against some targets like shield-batteries, infantry in trenches, and even against troops lying down. Owing to these defects the cavalry is to get a new gun, the construction of which is not yet completed, it seems. The shields have also been improved recently. Besides the guns, the French take into the field a heavy 15·5 centimetre quick-firing field howitzer (Rimailho howitzer) ; this gun is about as efficient as the German howitzer as regards its fire effect, but less mobile perhaps. The barrel of the gun, for instance, is carried on a special carriage when on the march, and placed only on the gun-carriage when required to fire. The mountain guns adopted by France are guns with the barrel moving forward when fired.

The principle of the barrel moving forward consists in the barrel, when fired, being relieved in the cradle from a catch-position in rear ; the barrel then moves forward, and, at the moment it has reached its foremost position in the cradle, it discharges the round. The recoil then throws the barrel back into its original catch-position. The path described by the barrel in its recoil, is less by about a third the path described by the ordinary quick-firing guns.

The new French gun of this type has a calibre of 65 millimetres, is equipped with common shell, and besides has shrapnel that is effective up to 5,000 metres ; the gun can be transported by five carriers. But the gun, like the French field gun, needs anchoring, the spur requiring, moreover, to be held firm in the ground by a kind of pin.

The Russian gun is a quick-firer of 7·62 centimetre calibre with great ballistic properties. Its initial velocity is 593 metres, with a pressure at the muzzle of 116·6 tons, against 530 metres and 103·2 tons of the French field gun. The weight of the gun is accordingly great ; the range with percussion fuse is 6,000 metres, and with time fuse 5,550 metres. Some of these guns, M. 1902, have been used already in the Manchurian war, its properties being known since then. Trials are being made with howitzers. In addition to the 12 centimetre howitzers, made in Russia itself after Krupp's pattern, 15 centimetre howitzers are being manufactured, it is said, after Schneider's pattern. The heavy artillery of the field army is to be supplied with a 15 centimetre howitzer of Schneider make. Further, guns of 10·5 centimetre calibre are said to have been ordered from Schneider for the heavy artillery, these guns being probably intended more for siege purposes. The mountain guns of the Russian artillery are 7·62 centimetre quick-firing guns with protective shields, adopted in 1904, and used already in the Japanese war, since when the barrel of the gun has been reconstructed. The gun travels, as a rule on a gun carriage, but can be carried by six pack animals; its range is 4,160 metres with percussion, as well as with time fuse. Besides, a new 75 millimetre gun of the Schneider-Danglis system has been adopted, which is much more efficient.

England is equipped with a quick-firing gun of 8·38 centimetre calibre, and with a lighter one of 7·62 centimetre calibre for horse artillery batteries, both guns being of the 1904 pattern. In addition, 536 guns of the old 15-pounder pattern have been changed into quick-firing guns with protective shields; these guns have been handed over to the Territorials, whose cavalry got the old Ehrhardt 15-pounders (7·62 centimetre) supplied in 1900. Trials have been made with a 11·4 centimetre quick-firing field howitzer, which had been issued to the troops, but were withdrawn again for alterations; their re-issue is, however, now proceeding rapidly. Trials are also made with 10·5 centimetre and 15·1 centimetre howitzers, of which great things are expected. There exists, further, a 12·7 centimetre siege gun, M. 1907 (60-pounder).

The Italian Army is equipped with a Krupp field-gun, C. 1906, which complies with all the most modern requirements, shows a particularly high rate of fire, and attains a range of 6,000 metres with time fuse. The heavy artillery of the field army is to get howitzers and guns. Krupp's 14·9 centimetre type is selected for the former; trials are being made with a 12 centimetre type of home construction for the guns. Nothing is heard about light field howitzers.

Their introduction does not seem to be planned for the present.

Austria has a 7·65 centimetre quick-firing gun with a barrel of forged bronze, and protective shields; with very good ballistic properties, low weight, and the latest appliances for laying. There is also a light 10·2 centimetre field howitzer of an older construction, without recoil of barrel. The original intention of adapting them to modern ideas has been given up. They are now to be replaced by a new howitzer. A new heavy field howitzer of 15 centimetre calibre is also going to be adopted. The very heavy barrels of the present obsolete guns are to be retained, it seems; this would greatly impair the mobility of the batteries. Trials are being made with a new light 10·2 centimetre field howitzer, and with various 7 centimetre mountain guns with recoil or with advance of barrel. A 10·2 centimetre quick-firing mountain howitzer with recoil of barrel has already been issued to several army corps. But the question of howitzers is not yet finally decided, it seems.

Turkey at last, which in a European war is sure to be of some importance, has modern 7·5 centimetre Krupp guns, a number of Krupp's 15 centimetre quick-firing field howitzers, and a large number of quick-firing mountain guns of the same firm. Mountain guns have recently been ordered in France.

The smaller European States are on the whole equipped with a modern artillery similar in efficiency to that of the great military Powers.

The enhanced effect of this modern artillery has contributed its share in loosening all tactical formations.

Closed bodies of troops can no longer move to-day within the zones of effective artillery fire. When coming within its range, we are obliged to unfold the masses coming up by the roads and to split them up into fractions, so that these may find some cover on the ground, at least from sight. This is all the more necessary because the roads can be enfiladed by indirect artillery fire with the aid of maps. The formations when moving must also be chosen so as to offer as small a target as possible to the cone of dispersion of shrapnel fire. We will be often forced to cross dangerous stretches of ground by night and approach the enemy's position under cover of darkness. As a result of this increased effect of artillery, it becomes necessary to begin the attack, where it is not covered by ground, much sooner than hitherto; indeed, at distances, generally, preventing personal reconnaissance of the ground and of the enemy's measures by the leader, thus obliging him to make his decisions on what information he receives from his reconnoitring organs. It is obvious that this distant artillery fire must affect strategy and tactics widely as regards time and space.

All movements of troops on the battlefield itself must be made beyond the zone of artillery fire, and thus begin a long way off. If hostile balloons can see these movements, they must be made if possible so as to avoid the zone of indirect artillery fire as well. All enveloping movements must therefore begin at some distance from the battlefield. They must be carefully veiled or initiated by night marches, if they are to be a surprise. Greater distances must be kept between the lines of infantry following behind each other, owing to the great depth of shrapnel fire; the intensity of fire has contributed to loosen the fighting formations of infantry, which in turn causes the battlefields to increase in extent out of proportion with the number of troops engaged. All this taken together requires reconnoitring to be done more rapidly, so as to group the forces early, not only according to the wants of strategy, but of tactics and the future conduct of the action itself as well. Modern fire affects, of course, the tactical employment of cavalry too.

The infantry being obliged to unfold and deploy for action early, still more so is this necessary for cavalry, which presents a more favourable target than its sister arm. Nor can it hope to escape the effects of the enemy's artillery by the rapidity of its movements when the guns are properly served; it will suffer grievous losses if it comes under effective shrapnel fire when in dense formations. Cavalry must, therefore, adopt loose formations early in action so as not to afford the enemy's artillery a good target. The occasion for cavalry to charge infantry under specially favourable circumstances will also be rare, considering the formations in which infantry fights and the effect of modern firearms as described already in another chapter.* But when cavalry is obliged by circumstances to charge the front of troops steadily firing, the form of charge must be altogether different from what it was before. It can no longer use the line in two ranks when charging infantry in action, as that would be simply self-destruction. The cavalry will try to cross the dangerous zone at its greatest speed, several lines deep in single rank, with intervals between the troops, and with closed bodies in small columns in the rearmost line. It will, if possible, advance on the broadest front permissible, and from different directions, so as to distract the hostile fire. Frontal charges made on artillery lines have more chances to succeed than on infantry firing, if the charge is delivered in suitable formation. But it is hardly ever likely that on the battlefields of to-day artillery can be charged in front without the necessity of charging infantry at the same time. Charges on the flanks and rear of artillery, however, have great chances of succeeding now as before. But these will be of very rare occurrence in direct co-operation with infantry, and then only on a small scale. The cavalry is thus almost completely driven away from the common battlefield of the other arms by the modern weapons, and mainly restricted to acting on the flanks and rear of the hostile army. On the other hand, cavalry is now itself equipped with firearms, and can use them when charging is impossible. This opens to cavalry new spheres of activity, which promise great and important results if it understands how to make full use of its mobility, by being mounted, for acting in decisive directions with its firearms.

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* Vol. i., book i., chap. ii., p. 39.

Firearms absolutely rule tactics to-day, and dictate to tactics their laws. Firearms have altogether changed the conditions under which cavalry can act, conditions which the cavalry cannot disregard without losing its place in modern war. The way in which it must act in future will be described in another chapter

The need for greater fire effect that asserts itself in all branches of warfare has even led to our falling back on methods which seem to be altogether antiquated. For close combat, especially for the possession of entrenched positions and permanent works, it has become necessary to look for some means of compensating for the artillery fire which cannot accompany the attack up to the last stages, nor support the defence to the very last. So we have fallen back on hand grenades, which, at close ranges, are hurled into the enemy's works, where they explode. Such projectiles may also be thrown from small mortars. The development of these missiles is not yet in its final stage; more may be expected of them in the future.

Krupp has even now constructed a contrivance for throwing bombs that will probably be of much service.* A bomb filled with high explosives, and fixed to a guiding rod, is inserted into the loaded cannon at the muzzle, with the guiding rod first, and in such a way as to bring the bomb to sit on the muzzle, whence, on discharge, it is thrown forward with sufficient accuracy at a high angle of elevation. The projectile, weighing over 80 kilograms, attains a maximum range of 300 metres, and owing to its very steep trajectory can be thrown behind any cover. The cannon rests on a gun-carriage that can be put on wheels, and is narrow enough to be moved about in the trenches. Its effect is solely due to the fire, smoke, and air-pressure produced by the enormous explosive charge. Nothing can keep alive in its proximity. The suffocating smoke and the poisonous gases will make it probably impossible for anyone to occupy the parapet behind which some of these bombs have exploded. Perhaps obstacles can also be destroyed by these projectiles, and men be rendered unconscious in the defences of the ditch. The importance of this new arm can only be established by experiments.

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* *Kriegstechnische Zeitschrift,* vol. v., 1910.

The efforts also for fighting balloons with artillery have already produced some fair results. Captive balloons can be brought down easily by any field artillery with shrapnel fire, and against non-captive balloons and other air-craft good results have already been obtained with guns partly designed especially for that purpose. In America, England, France, and Germany, experiments have been made of this kind, the targets being represented by kites, non-captive and captive balloons, the latter being towed by rapid moving ships. It was then found that really good effects can only be obtained by guns specially designed for that purpose. Unlimited traversing motion, great elevation, maximum possible rapidity of fire, great velocity of projectile, great accuracy of fire, and great mobility of the gun, are the chief requirements a balloon gun must fulfil. It is further necessary that the trajectory should be made visible so as to allow corrections to be made. The guns to fight the balloons fulfil these conditions as far as possible. They are constructed so as to be used on an ordinary gun-carriage, or on motor-cars, or in a fixed position on a centre pivot-carriage. The latter are designed for ships, coast defences, and fortresses, and the other two types for field operations. The motors carrying the guns have been mostly armoured to give protection against hostile fire. But it may be doubted whether the armoured automobiles will suit for active operations, as they are tied to the roads, and very materially lose speed owing to the armour. The gun-carriage on the other hand, being drawn by horses, will probably not be in time at points whence good effect may be expected. A combination of motor-car and travelling gun-carriage has therefore been tried which enables the gun, while on the travelling gun-carriage, to be transported by the motor, and when required to go into position, it is taken out of the motor-car and pulled by men to where it is wanted. But it cannot be considered that this question is solved in a satisfactory manner. The projectile best suited against balloons is common shell with a highly sensitive fuse, that bursts the shell even on impact with the balloon cover; shrapnel is best against air craft. Both kind of projectiles must be provided with a composition generating smoke in its flight during day, and some kind of light in the dark, so as to show the path described by the projectile. Great rapidity of fire is ensured by the use of automatic breech-action, by limitation of calibre, by a practical method of laying the gun, and by the aid of a range-finder; flatness of trajectory, great rapidity of flight of the projectile, and accuracy of fire are obtained through the length of the barrel, and by great muzzle velocity.

Such guns have been constructed in Germany, France, and England. Their calibres vary from 3·7 to 10·5 centimetre; their sights allow the guns to be elevated up to 75 degrees, and to be traversed 360 degrees. Some of these guns range far and high. Krupp's 10·5 centimetre gun on a centre-pivot naval gun-carriage, has, for instance, thrown a projectile

11,400 metres high, and has attained a maximum range of 13,500 metres.

Many are sceptical on the point of fighting flying machines with guns. So long as these machines move within reach, they can best be attacked with infantry and machine gun fire. Some, on the other hand, hold that flying machines can only be effectively dealt with by their own kind. These questions want to be further inquired into. But for all that, it is certain to-day that balloons, airships, and flying machines can be dealt with effectively by fire, and that the machines attacked must try to escape the effect of that fire by rapid movements, as well as by frequent changes of direction and of level.

The perfection of firearms having thus plainly affected the tactical employment of all arms and their formations when in motion or in action, to such an extent as to cause protection to be sought against undue losses as well as against view, by an increased use of natural cover, by looser fighting formations, and by movements at night, has led, on the other hand, to greater value being attached to artificial cover.

The infantry, which is the most exposed, made the first efforts to guard against the effects of the enemy's fire. Trials were made to protect the skirmishers by bullet-proof equipments (Dove's cuirass); recently the knapsacks were armoured, so that the infantry men should find some cover when lying down behind them. But all these devices are of no practical value so far. Extensive use, however, has been made in the last wars of earth cover, constructed before and during an action; and we may be sure of similar efforts being made in future.

Shallow trenches for skirmishers lying down chiefly protect against frontal fire of infantry ; deep, narrow trenches for firing standing, which are sometimes provided with splinter-proof overhead cover, give protection from shrapnel fire as well. Strong overhead cover provides protection against high angle fire for supports held in readiness close in rear of the foremost line ; covered approaches allow reserves to be led forward into the firing line unseen and without loss. If time and material are available, closed earthworks can be built to form specially strong pivots of a defensive position.

This kind of earth cover has frequently been used, especially in the South African and Manchurian Wars. The Boers entrenched their defensive positions in a most able manner ; the English repeatedly made use of the spade even in the attack ; and the war in Manchuria has been fought out almost as much with the spade as with the firearm. The Russians nearly always fought in strongly entrenched positions ; the Japanese, too, made use of the spade in attack. It is easy to understand, therefore, that entrenching in action is looked upon as a *necessary* corollary to modern armaments.

This deduction seems to me to go too far. In South Africa, the advance of the English was tied to the few existing railways, and thus to definite directions of attack ; independent operations were generally out of question. But the Boers conducted the war defensively, as they never tried offensive conclusions, at least, not in the first part of the war. They were, besides, always inferior in numbers, and could always be sure of the enemy's direction of attack. They had, therefore, every inducement to raise their defensive power by strengthening the ground, and had no reason to be afraid of having worked in vain.

In the Russo-Japanese War the conditions were in many ways similar. The Russians fought to gain time. They, too, avoided offensive tactics generally, in the vague hope of being able to carry on the war longer than the enemy, and to conquer gradually by the steadily increasing superiority of their numbers. They therefore opposed the enemy whenever possible in fortified positions. Both adversaries were confined to definite directions of operation by the only railway and the few available communications, as mentioned already in another chapter.* It was only to a very limited extent possible to deviate from their directions. And so the Japanese could make use of the spade, too, where they were temporarily thrown on the defensive, or voluntarily remained so. The slow progress of the war, caused chiefly, as in South Africa, by the difficulties of supply, was also in favour of an extensive use of defensive fortifications. But where in the attack use was made of the spade, it was in most cases probably due to the fact that the moral and physical forces of the troops for any further advance were exhausted, and that the ground gained had to be secured against reverses. In the course of the war the Japanese have certainly used the spade systematically in the attack, and carried also sandbags to obtain cover in the firing positions; but it is difficult to ascertain by what experiences and by what special conditions these measures were caused.

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* Vol. i., book ii., chap. i., p. 76.

How far they had been justified by themselves, and might be a guide for our conditions, shall be examined in another place. But it is hardly likely that in a Central European war strategic conditions could prevail similar to those in the Russo-Japanese War, and that a European army could be imbued with similar views as the Russian commanders on the value of field entrenchments.

There will certainly be cases in a Central European war where the use of entrenchments is advisable, when the assailant is confined to a definite direction of attack. But the negative results of the Russians, who were constantly fighting in superior numbers, do not altogether speak in favour of this procedure; while, again, the South African War furnishes the proof how, under certain circumstances, the entrenchments of a good position, jointly with a deliberate use of the firearm, may allow also numerically inferior forces to offer a prolonged resistance, even against overwhelming odds. It is short of the marvellous to see the extended positions taken up by the Boers and the English unable to storm them.

These experiences and conditions, so often contradictory, require to be closely and critically examined before we can generalize on the results obtained. Here I only wish to establish that the demand for increased substantial cover is the consequence of the improvement in modern arms which has asserted itself in all the recent wars everywhere. How far we are allowed to meet this demand, the connection and mutual dependence of the various elements of warfare only can tell us.

Artillery feels the want of cover, too. This is clearly seen by their efforts to take up covered positions and fire indirectly. It has also led, as we have seen already, to the introduction of protective shields, which give fair cover from frontal shrapnel and infantry fire. Batteries facing each other frontally cannot therefore hurt each other much by shrapnel fire. We must try to cause damage by full hits of common shell. The composite projectile of the German field howitzers will, without doubt, prove particularly effective for that purpose. We can also endeavour to obtain hits behind the shields by oblique fire. To meet such fire it has been often proposed to use broader and curved shields. But these could not procure complete cover either. At any rate, a frontal duel between artilleries of equal efficiency can only be decisive to-day if a large amount of time and ammunition is spent; artillery can, therefore, hold out for some time under the fire of hostile artillery without even sufficiently replying to it. Both these points are important for the tactical conduct of an action.

Cavalry, when it decides to use the carbine, will feel the want of entrenchments as well. The Boers in Africa, who were really fighting as mounted troops only, have, as we saw, made continual use of entrenchments. But the experiences gained there scarcely apply to European conditions. The African horsemen seem to have carried their entrenching tools in their oxen waggons, and it is only due to the incredible slowness of African warfare that the tools were always in time for use. This would be impossible during active operations in Europe. Here, the experiences of the American War of Secession may rather apply. During the great cavalry combats of those days, use was also often made of firearms, but we hear little of cavalry entrenching, while infantry did so extensively in the defence; the actions came off too rapidly and energetically for that; and so they will probably in a future war. Still, cavalry may often find itself in future in situations where it will be obliged to entrench for an obstinate defence, especially in localities. The fewer means cavalry has for that purpose, the more it needs to make the best use of ground and existing buildings for neutralizing the effect of modern arms.

The preceding comments having demonstrated that, in field operations, fire and cover have increasingly affected each other, we see that the same process, but to a greater measure, has taken place in fortress warfare. The heavy garrison guns have also developed in a manner altogether surprising, and attained ranges and force of percussion necessarily affecting deeply the construction of permanent fortifications.

Where it was a question of securing certain objects against being *reached* by hostile fire, the works covering them had to be pushed further forward to meet the longer range of the guns; where, on the other hand, cover was to be provided from the *effects* of that fire, the defender was obliged to have recourse to altogether new constructions. Under no circumstances could he suffer the attacking artillery to be superior in this respect. If, in active operations in the field, the construction of cover is not always convenient, though often an auxiliary means that cannot be avoided, effective cover from the enemy's fire in fortress warfare is by itself the determining factor.

And thus, to attain complete cover, concrete and armour plates were adopted, efforts being made as far as possible to secure the objects against hostile fire by their position as well.

Under the force of circumstances two typical forms of modern permanent fortification have been evolved, namely, large army fortresses, and barrier forts. The object of the latter is to block certain communications, and to secure the possession of some important points in the country, whence the surrounding ground can be commanded by artillery; and, where coast defences are concerned, to sweep the channels or defend points specially favourable for landing. The large fortresses, on the other hand, are meant to secure the possession of large towns, which, for some reason or other, are of strategic importance. It being impossible, owing to their size, to secure them by continuous lines, we surround them with a chain of forts pushed far in advance, which must possess great power of resistance, and form, as it were, pivots of defence. The intervals between these works are defended by the garrison of the fortress, and strengthened by suitable entrenchments. Intermediate works and ammunition depôts, of permanent construction, are to facilitate an energetic defence.

The disadvantage of these large fortresses is their extent. They need strong garrisons for their defence, and take away forces from the field army. We must, therefore, when constructing such fortresses, always impose some limitations on ourselves as to the number of points to be fortified as well as to their extent. But the various defensive works, be they barrier forts or forts of a fortress, we must withdraw from the enemy's sight as much as possible, by site and structure on the one hand, and on the other must make them as capable of resistance as possible. Overhead and outside cover are made of concrete, and the guns are placed in the permanent works protected by armour. Observing stations are armoured too. The flank defences of the ditches are secured against direct fire by being placed behind the counterscarp, or sunk in the bottom of the ditch where they can scarcely be struck by direct fire. The revetments of ditches are also secured against direct fire. They can only be touched sometimes by high angle fire.

In the face of these new means and kinds of fortification, the siege artillery adopted guns of a calibre growing larger and larger ; accuracy of fire was striven after as far as possible, so as to pierce the solid cover, and hit the small targets presented by the armoured cupolas topping the armoured turrets. These things developed pretty well alike in all the great armies. In Germany, the garrison artillery is equipped with 15 centimetre howitzers—being the same gun as the heavy artillery of the field army—with the new 21 centimetre mortars, and with long 10 centimetre and 13 centimetre guns, which latter have replaced the long 15 centimetre gun. Many guns of older patterns are, of course, still in use in the fortresses until gradually replaced by newer types.

The guns with flat trajectories serve above all in the defence to take under fire all approaches, railway structures, bridges, artillery and engineer parks, localities, airships, etc. Their extreme range is often made use of for that purpose from advanced positions. In the attack these guns have the task of firing at localities occupied by the defender, into the town itself, on troops on the move, on tramways, at vertical walls of concrete, outside armour, and obstacles. The 15 centimetre howitzers are chiefly meant for fighting down the artillery and infantry positions. The field artillery is co-operating with these guns in the defence as well as in the attack. The 21 centimetre mortars are mainly used against the strongest works of the enemy, and against guns protected by armour. These latter are partly heavy guns for distant ranges, and partly quick-firing guns of small calibre for close defence and for sweeping ditches and obstacles.

It is, however, not anticipated that decisive results will be obtained with these guns against modern cover. All that can be obtained, perhaps, is a temporary throwing out of gear of the armour turrets' mechanism, thus causing their fire to be kept down.* But experiments in peace and experience of war have demonstrated that heavier guns than those mentioned are wanted actually to demolish modern works.

The only experience of war deserving notice in the domain of fortress warfare is the siege of Port Arthur. But regard must be had to two things when estimating the experiences gained there: firstly, that the fortress was not at all constructed from the most modern points of view, that it was not at all armed throughout with first-class guns, and, therefore, incapable of that material resistance we may expect from a modern fortress; and, secondly, that the Japanese had no well organized siege artillery either. They were, it is true, already provided with 28 centimetre mortars,

* "Anleitung für den Kampf um Festungen," 146.

but with very few only, and their other guns were not fully equal to the task of fighting modern works of fortification. Under these circumstances the artillery of the attack proved unable to master the permanent fortifications completely, and to prepare them for assault. Recourse had to be had to mining operations for subduing the fortress.

If we bear in mind the enormous strength a real modern fortress may possess, we must realize from the outset that considerably stronger guns must be used than our 21 centimetre mortars.

For instance, 200 armour turrets have been given in commission for the fortifications of Antwerp, each turret being armed with two 15 centimetre guns; for some fortifications of Reval, 20 armour turrets for 30 centimetre guns are said to be provided for; and in America, gun-trials have been made against armoured concrete more than 6 metres thick. Modern artillery must take account of all this kind of cover in fortress warfare so as to match it at least.

But in spite of all increase of calibre we have not yet succeeded, on the whole, in raising the effectiveness of artillery to such an extent as to ensure rapid and decisive results on modern permanent fortifications. Opposed to the increase of calibre is the necessity of keeping the siege guns movable and mobile. The production of the movable 28 centimetre mortar must be looked upon as a triumph in mechanics; it must be left an open question whether more cannot be done in that direction. At any rate, conditions such as these have caused mining operations to gain increased importance. It seems to me that in this branch we are on the threshold of a development to preconceive which is, perhaps, one of the most important problems in the preparation for war.

Things are somewhat different with regard to coast defences. Here, as with siege artillery, it is a question of putting up powerful armour-piercing guns with the object of fighting effectively men-of-war; but as these guns need not be moved about in the country, but can be placed in fixed positions, and as, on the other hand, the strength of the armour to be pierced must keep within certain limits to prevent the ships losing too much of their mobility, the problem is much easier to solve in this case, and larger calibres can be used.

It is not very long ago that 28 centimetre and 30 centimetre guns were the largest calibres used in coast defence; muzzle velocity, and with it force of percussion, was raised by increasing the length of barrel up to 50 calibres. Recently, however, a reaction has set in, started by America.

In the United States the impossibility was recognized of effectively combating enlargements of the bore caused by great initial velocities and pressure of the gases. It was therefore decided to reduce the muzzle velocity very materially, and in its stead to enlarge the bore from 30·5 centimetres to 35·6 centimetres. The first of these new guns had an initial velocity of 655 metres against 762 of the 30·5 centimetre gun, but in return for this the projectile had a weight of 753 kilograms against 454 kilograms of the 30·5 centimetre gun.

England followed on the same lines. Here the question was decided not so much on account of the enlargements of the bore as by the other defects of the English wire-wound guns. The 30·5 centimetre gun of but 40 calibres' length was wanting in rigidity, and this weakness, of course, asserted itself still more with barrels of 50 calibres' length. The 30 centimetre gun of 50 calibres has, therefore, been replaced in England by a 34·3 centimetre gun of 45 calibres' length; and it is, at the same time, intended to discard altogether wire-coil guns and to adopt the jacket structure almost everywhere in use.

France has joined this movement too. Coast guns have been constructed there of 36·8 centimetre calibre. The length of barrel of these guns sinks to 37 calibres, and the muzzle velocity to 725 metres, while the French 30 centimetre gun with 50 calibres' length has an initial velocity of 800 metres. On the other hand, the weight of the projectile has risen from 449 kilograms to 798·3 kilograms.

In face of such developments the German guns maintain a distinct superiority. The Krupp guns can stand the great initial velocities without showing the defects of the foreign guns. A new Krupp gun of 35·5 centimetre calibre, with 50 calibres' length of bore, and with a projectile weighing 620 kilograms, has a muzzle velocity of 935 metres with a pressure of 27,650 tons at the muzzle.*

In addition to the armour-piercing guns firing from armour turrets or disappearing gun-carriages, the heavy howitzers are of special value for coast defences. They are designed to deal with the armoured decks and the interior of ships, by high angle fire from covered positions, impossible to reach by naval guns or from armour turrets; these guns gain more and more in importance. A typical gun of this kind is the Krupp 28 centimetre coast defence howitzer. It hurls a projectile of 345 kilograms weight to a distance of 10,600 metres; and at 8,300 metres' range it pierces an armoured deck of 178 millimetres thickness when striking it at an angle of 51 degrees, and of 221 millimetres thickness striking it at an angle of 69 degrees. Guns of this sort will prove highly dangerous to fleets in attack, and are therefore of special use to Germany.

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* *Vide* Loebell's "Jahresberichte," 1911.

CHAPTER IV

TECHNICAL APPLIANCES IN WARFARE

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We live in times of an enormous advance in the exact sciences and technics. Nature has revealed to us in the last decades numerous secrets, which have been made to serve mankind in a practical way. Some of the achievements are certainly in their infancy still, yet we can already perceive the far-reaching importance they will gain. In all that concerns modern inventions, cognitions, and productions, we see a further increase of man's mastery over Nature. The art of war has, perhaps, profited most by this progress in practical science ; the rage, even, for being as modern as possible in that field goes in many ways far beyond what may be of practical value. We must not overrate the importance of practical inventions for war, nor, above all, imagine that mechanical appliances, be they ever so excellent, can make amends for deficiency in military and moral qualities. But we must, on the other hand, with inexorable logic and consistency, theoretically and practically, draw the consequences actually and necessarily resulting from this progress in technics. To foresee these actual and necessary consequences of new mechanical achievements, and to take notice of them in practice, is one of the most essential tasks in the preparation for war even, and Prussia especially can boast of brilliant successes in this domain in times past. To examine the achievements of modern times from this point of view, seems, therefore, a task especially needful.

Apart from fortress warfare, there are, above all, three great departments in which much has been achieved by military technics, namely, the ordnance, transport, and communication services.

I have dealt with the importance of modern fire-effect in the previous chapter. We have seen there that the effect of modern firearms exercises a great and direct influence on the character of the combat, and, therefore, on the conduct of an action ; and we had to acknowledge that, indirectly, strategy is affected as well by the altered nature of battle.

It is just the reverse with the influence of the means of transport on the conduct of war. They *directly* increase strategic mobility of the troops, and benefit the strategic grouping of the forces ; but *indirectly* they are of some importance for the conduct of battle, by promoting the independence of the troops of their lines of communication, by facilitating the bringing up of supplies, and by creating possibilities for concentrations and movements which did not exist formerly. Commanders acquire thereby greater freedom of action.

The most important means of transport are, of course, the railways,* which alone make it altogether possible to concentrate, move, and supply the huge numbers of modern armies. The efficiency of this grand means of communication has been substantially raised since the last great wars of Germany. All the Great Powers of Europe have striven to enlarge the railway nets, often even from a military point of view chiefly. Locomotives and carriages have also been greatly improved.

The locomotives are now largely manufactured on the superheated steam system. Great additional power is thereby developed, while fuel and water is saved, and the steam-power fully utilized. The weight of the engines has also increased to raise their power of traction. The strongest German engines, weighing 88 tons without tender, attain a speed of 138 kilometres per hour. As regards their tractive power, Germany distinguishes between engines of full, half, and lower power of traction, according as the machine is capable of pulling a whole or half a military train of 110 axles or less, over gradients of 1 : 200, at a speed of 22·5 kilometres per hour.

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* For railways see : Schmiedecke, "Die Verkehrsmittel im Kriege" ; Bronsart, v. Schellendorf, "Der Dienst des Generalstabes" ; v. Budde, "Französische Bahnen im Deutschen Kriegsbetriebe."

The carrying capacity of luggage-vans is also higher. While in 1860, it was 10 tons, it is now in Germany from 12 to 15 tons; there are, besides, special vans of 20 to 30 tons loading capacity. The greater pressure of the engine wheels on the rails and increased velocity have caused the rails to be made stronger too, and to be fixed firmer in their position. The rails, manufactured from rolled forged iron, and used by the great railways in Germany to-day, weigh 41 to 44 kilograms per metre, and are 15 to 18 metres long. In other States, even heavier rails are in use. Traffic is made safe by electric signals, electric bells, and by the block system. Bells report the arrival of a train. The block system ensures the proper starting of trains, as the signal for a train to leave can only be given when the road is clear; the block system at the same time allows a more rapid despatch of trains, if one or two block stations are interposed between two railway stations; in that case several trains can run on that portion of the line in the same direction. Signal boxes make traffic safer; they permit the points and signals of one station to be worked from a central position by *one* official, and are arranged to prevent signals being given to a train to enter the station when the points are incorrectly set. Finally, may be mentioned the patent brake worked by the engine driver for the whole train, and acting automatically if anything goes wrong with the train.

In Germany, we distinguish between trunk lines, branch lines, and local lines, according to the nature of the traffic. Trunk lines and branch lines have the same gauge. But on the latter the trains must not exceed speeds of 40, and, at the most, 50 kilometres per hour. The permanent way of these lines may be of slighter build ; they must, however, allow engines and carriages of the main lines to pass over them. By local lines, are meant those lines which have a gauge of 1·435, 1·0, 0·75, or 0·60 metres, the trains being not allowed to exceed a speed of 30 kilometres per hour.

The whole railway net in Germany is divided into twenty-six lines or administrative districts, comprising, in addition to the trunk line, the adjoining branch lines. The necessary articles for fitting out all fourth-class carriages and suitable goods vans for the transport of masses of men and horses are kept in store in peace time. The material for improvising camps is also held in readiness for all military trains transporting troops and formations of the field army.

In case of war, the whole railway service is placed under military authority. All railway administrations, with their whole personnel and matériel, come under the military railway authorities. The whole railway service, as applied to military purposes, is in Germany controlled by the Director of Field Railways. Most of the railways continue of course to work as in peace generally, even in case of war. Those lines which come under war conditions are expressly named. They will be those lines which are considered as being in the theatre of war or in its neighbourhood. On these lines, too, the railway service remains in the hands of the civilian railway directors and administrations, but the basis of all traffic on them is the military time-table. How far the carrying capacity of the railway is to be made use of is decided by the Director of Field Railways, who also issues orders as to whether, and to what extent, public traffic may be allowed. Public traffic is never allowed as a matter of principle on the lines in the actual theatre of war.

"Military management" takes the place of war management on those lines which have been captured during the war, or have been constructed by the military authorities. "Military management" may also be ordered for lines which work under peace or war management. In that case the military directors of railways take over the administration and control of the lines. One or two military railway detachments are given them for managing the traffic. At the same time, the civilian personnel of the lines may wholly or partly continue to serve on them. The military time-table regulates all traffic.

This time-table exacts the maximum possible traffic at an average speed of 22·5 kilometres per hour. As a consequence the number of trains running daily is different on the different lines; the number depends on the greatest distance between two stations and on the nature of the line, and thus may greatly differ on the various stretches. Special stops are interposed for reasons of management (taking in water and coals, etc.), and for feeding the troops on their journey at supply stations previously fixed.

To simplify management the twenty-four hours of the day are divided into six periods of four hours each, the trains in each period being arranged as much as possible symmetrically. The trains running in all the periods at the same place form a series, and all trains running on one day form an echelon. But it is impossible to use all the trains of one echelon; safe management does not admit of reckoning with the maximum performance. We therefore, as a rule, drop all trains of one period, obtaining thereby a day's interval, or we drop one or more trains in each period.

For entraining we allow one hour per train for infantry, two hours for cavalry, field artillery, heavy artillery, and ammunition columns, and three to four hours for siege material. For detraining, when the train can be unloaded all at once, we calculate thirty minutes for infantry, and fifty minutes for cavalry and artillery; and about double the time if conditions are unfavourable.

The distance daily covered is calculated by multiplying the number of hours actually travelled with the average speed per hour.

Owing to the importance the railways have gained to-day for all movements of troops, it is not only a question of making use of all existing railways; it may also become necessary to build new lines, to repair those destroyed by the enemy, and, on the other hand, to render useless lines used by the enemy, or those which we must leave in his hands.

With reference to the latter, we distinguish between *destroying* and *blocking* a railway according as to whether the interruption of traffic is meant to last for weeks and months or only for days and hours. In the former case we must above all blow up tunnels and bridges, and in the latter, injure more or less the permanent way. In order to destroy railways rapidly in retreat, the tunnels and bridges are provided in peace-time already with chambers for receiving explosive charges. But this kind of destruction must not be carried out without orders from highest military authority. Hasty demolitions, however, may be ordered by subordinate commanders. Railway troops and engineers are employed to carry out the former; hasty demolitions, especially within reach of the enemy, are, as a rule, done by cavalry, which for this purpose is equipped with explosive cartridges (thirty-two per regiment) and with tools. The engineers and railway troops carry with them explosives in the form of charges or cartridges. The ammunition columns on the lines of communication also carry blasting powder.

Repairs are executed by railway troops; civilian labour is only used for extensive earthwork. Generally the permanent way and bridges must be repaired, as we know from the latest wars, but sometimes tunnels, blown up or blocked, must be opened. Not much labour is needed, as a rule, to repair the permanent way. When repairing bridges it is particularly important to tax to the utmost the personnel, to bring up all the accessories and machines that can be got hold of, and to start work systematically and deliberately. Wood is to be preferred as a rule for building material, yet iron bridges, kept in store, may often be used with advantage. It is often advisable to construct a new bridge close to the old, to save removing the debris of the latter. Each single case must be treated on its own merits according to circumstances. The same holds good for reopening tunnels. If the hills pierced by the tunnel have been very much shaken by the explosion, and have started moving, the labour of repairing the tunnel may become so extensive and take such a long time, that it is more practical to construct a railway around the tunnel. This question must be thoroughly gone into beforehand, else disagreeable surprises may be in store. Wooden structures inside the tunnel may not turn out strong enough to resist the pressure of the moving earth or rocks. There is, therefore, no guide as to the time required for those repairs. It took about six weeks in 1870-71 to clear the entrances of tunnels destroyed inside for a length of from 25 to 30 metres. It takes very much longer time to repair some more extensive damage.

When *constructing new railways* in war, their direction is laid down roughly first by the available maps, and then fixed definitely after reconnaissance on the spot. To trace the line in a practical manner is of greatest importance for the construction of the railway. The direction being fixed, the formation level is at once begun, the permanent way following it so as to be finished almost together with the formation level at the final railhead. In average country the daily task of formation level may be calculated as 1 metre per man; 3,000 workmen could therefore complete 3 kilometres of railway per day. Bridges for roads and watercourses to pass the railway cause special difficulties. They are best made of wood. The component parts of iron military bridges for large spans are kept in store during peace (Schultze's and Lübbecke's systems). Small wooden bridges, 4 to 12 metres high, need from three to ten days to complete them; trestle bridges of the same height need five to fourteen days per metre in length. Time and labour for more complicated bridges must be estimated separately. Building the bridges does not on the whole materially delay the completion of the line. Trained railway troops must be employed for laying the permanent way. About 2 to 2·05 kilometres can be completed daily by three railway building companies when working only at the head of the line; the rate can be increased if work can proceed from the sides at the same time. But we cannot reckon with more than an average of 3 kilometres per day generally. If we allow six to seven days for tracing the line, bringing up the material, and giving the necessary start for the foundation level, 30 kilometres of railway can be built in nineteen to twenty days, including some days for unforeseen delays.

Building these railways is rather an extensive operation, becoming effective after a comparatively long time only. Nor will the efficiency of such a rapidly constructed railway be anything like that of a first-class line. Its trace, being as a rule less favourable, the greater insecurity of the permanent way, as well as sharp curves and steep gradients, will all militate against it. Sometimes we may even be obliged to work with half (fifty-six axles) or still smaller trains. The efficiency of the line may be raised by building the stations closer together, and by gradually strengthening and improving the structure. But normal efficiency, as in peace, can never be attained, because, as a rule, it will be necessary for the sake of safety to run the trains, especially in the enemy's country, during day only. In theatres of war with a railway net little developed, it will be desirable, therefore, to follow the troops with a railway that can be built quicker than a first-class line.

Field railways are to serve this purpose.

They are, in Germany, railways with 60 centimetres gauge, the plant for which is kept in store during peace time. It consists of ready-made frames of tracks 5 metres long, of points, field railway carriages, field railway locomotives and tenders. The latest patterns of the latter are engines with tender, on four axles, with superheated steam appliance, pulling a weight of 60 to 70 tons at an average speed of 12 kilometres per hour; that is to say, a supply train of nine to ten waggons. The stations are placed about 5 kilometres apart with sidings 200 metres long, allowing an hourly service of trains at the speed stated.

Comparatively speaking, this railway can be constructed rapidly. The pressure of the engine wheels being only 1·5 tons, the bridges can be of slighter build than those of first-class railways; gradients and curves can be greater, and the whole structure more hasty. Connection with the existing railway net is established by a transfer station, which should permit the loads to be transhipped straight from one kind of train to the other, and which forms at the same time the depôt for the plant that must be there before the construction of the railway itself is begun. In average country, 10 kilometres foundation level can be daily executed by two to three railway-building companies, the permanent way advancing at the same rate as the foundation level is being completed. Under these conditions ten to twelve companies would be required for a line 100 kilometres long, because special companies in varying numbers must be allotted to the larger bridges, to the permanent way, the depôt, transition station, and traffic during building operations. To complete the whole structure, including organization of traffic, about seventeen days would be required. But by employing more labour, and by a more hasty construction of the line, this performance can be substantially increased, and a daily rate of 15 kilometres or more may be easily attained. Efforts must be made to advance the structure as rapidly as the army is advancing, as only then does it fully answer its purpose, as a rule. A day's interval in traffic is needed to compensate for breakdowns. Traffic should be avoided if possible during night. Allowing a day's interval to count as eight hours, sixteen trains can be run daily with an average performance of about 550 to 600 tons. To increase this performance two trains, following each other at 500 metres distance, can be run between the sidings instead of one train. For a short time even groups of trains can do so, if it is a question of rapidly forwarding large supplies. But such arrangements do not afford a permanent advantage. A detachment of about two companies for traffic and one depôt company are needed for the management of 45 kilometres.

Besides the field railways, tramways worked by horses are kept in store at the fortresses, with the siege artillery trains for conveying, during sieges and in the defence of fortresses, ammunition, guns, material for building batteries, and entrenching tools. Their gauge is 60 centimetres; the carrying capacity of the waggons is 1,500 kilograms. Two waggons are joined together by a platform for the transport of guns and siege material. The plant of the tramways is stored in units of 7·5 kilometres length with ninety waggons, which can be shipped in one train of a first-class railway. The tramway can be quickly laid, speaking comparatively ; under favourable conditions about 650 metres of rail can be laid in one hour. Gradients of more than 1 : 15 for any length, and curves with less than 20 metres radius ought to be avoided.

Disregarding the field railways and tramways, which are designed for special purposes, the actual railways (trunk lines and branch lines) are to serve for the concentration of troops in the first instance—that is to say, they are the means of assembling the troops for war ; in the second instance, they are to serve as the means of keeping up the communication of the field army with the home country during the war, with eventual support of the field railways. But we can use the railways besides for purposes of operations during the war itself, and for shifting troops in the theatre of war, and on the battlefield sometimes, and when retreating.

To solve all these tasks a suitable organization of all the railways at home is of primary importance. As many trunk lines as possible must lead into the area of concentration, and there must be in that area a sufficient number of railway stations suitable for detraining. The nature of the line must afford favourable conditions for traffic and present no steep gradients. They must be double lines, if possible, and have numerous stations to allow a rapid succession of trains. The block system and signal boxes must be in use on the line. Engines and carriages must come up to the most modern technical requirements, and be available in sufficient numbers. The railway officials must be trained and reliable, and the time-table must be drawn up for each individual line in accordance with its capacity. If the organization satisfies all these demands, we can count upon the transport of masses proceeding smoothly, always supposing that a maximum performance is not being exacted. On a double line, an eight series of service, and on a single line, a four series service, may be looked upon as a fair performance. The time and march tables give the distribution of the troops to the individual trains. One train can carry one battalion with regimental or brigade headquarters, or one squadron with regimental or brigade headquarters; or one and a half squadrons, one field or horse artillery battery with brigade, regimental, or *Abteilung** headquarters; or one field company engineers with divisional bridging train; or two days' supplies for an army corps and half a cavalry division. Thirty-four trains are needed for the transport of one division (less machine-gun detachments); 21 trains for the first echelon of ammunition columns and supplies; 23 trains for the second echelon; 118 trains for an army corps, including 6 supply trains, but excluding machine-gun detachments and heavy artillery.

For traffic on railways newly opened (in the theatre of war) it is first of all requisite for the personnel to know the character of the engines, so that proper use may be made of them. But regard must be had to the fact that the work of the engines under war conditions must be rated less highly than in peace time, because neither engines nor the lines can be kept in a state of repair as in peace. Traffic by night considerably increases the number of officials needed, and is dangerous in a district threatened by the enemy. It may be left an open question whether armour trains, as freely used in South Africa for the defence of railway lines, will turn out as well in a European theatre of war. At any rate, everything possible must be done to render the lines safe, and thus insure above all an orderly traffic.

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* Corresponding to a British Field Artillery brigade—*i.e.*, three batteries. —TRANSLATOR.

We must act in accordance with these general maxims if we wish to draw the fullest advantage from the railways. It is, on the other hand, obvious that a superior railway net and superior management of traffic constitute directly some military superiority by affording a *more rapid concentration of troops*, and *increased strategic mobility*.

In the most recent times electric power has become a rival to the steam engine, and seems to begin monopolizing rapid and distant traffic. Speeds of more than 200 kilometres per hour have already been attained by electric motor cars. The superiority of electric power is further accounted for by the smaller weight for traction. The weight of the German express-train engines with tender is almost half the weight of the whole train. A great deal of tractive force is thereby lost. The electric motor, on the other hand, is supplied with power without weight. The resistance of the air, too, which the locomotive has to overcome, is, owing to its size, greater than with a motor car. Matters seem to have taken a more definite shape recently as regards the construction of electric trunk lines, which obliges us to reckon with a further development of this means of transport. But it is not to be anticipated that steam power will be entirely replaced by electric power, at least, not for the present. The cost and the economical revolution would be so great as to make such an idea for these reasons alone seem infeasible for the time being. The transition from one to the other will, at any rate, be by degrees only. Still, this matter must not be lost sight of from a military point of view, since the whole military transport and communication service would be affected by such a change.

But even should circumstances gradually bring about the ascendancy of electric power over steam power, traffic would always be confined to fixed rails. This, as a matter of course, will prevent the troops from drawing their supplies straight from railways. Special means of transport will still be necessary to communicate between railheads and troops, and the amount of transport must become the greater the more the troops outdistance these railheads. The importance of these means of transport grows when only few railways are altogether in the theatre of war, and when the army conquering invades the enemy's country, where all the railways have been thoroughly demolished, and when, lastly, we do not succeed in rapidly and completely repairing what has been destroyed.

In all European wars, draught animals were almost exclusively used, so far, for this kind of transport, exceptionally, perhaps, pack animals. But it is obvious, and is confirmed by experience as well, that this mode of supplying troops is bound to be very slow and difficult. The draught or pack animals need first of all themselves a good deal of supplies, if they are to keep efficient; and secondly, their power of marching is certainly very limited; at any rate, not at all materially greater than that of the troops themselves, and this causes the troops sometimes to restrict their movements out of regard for supplies. It was, therefore, one of the first problems for mechanics to design means for limiting, as much as possible, transport by animal power.

Motors now do away with this defect.* They are the latest achievement in military transport service, and seem specially fitted for facilitating materially the transport of goods behind the armies. All draught animals can now be spared, which is of greatest importance; few vehicles can carry very much greater loads than those of draught animals, and the speed of these vehicles is much greater than that of the former columns, thus enabling the troops to be supplied without their needing to shorten the marches demanded by strategy.

Tractors with internal combustion and others with internal-combustion-engines are of greatest use in operations. With the latter, the electrical power is generated in the vehicle itself. With the former, internal combustion sets a dynamo machine in motion, transferring the electric energy to electro-motors, which work the wheels. Germany has constructed tractors for use in war after both systems. The so-called *Armeelastzug* (Army supply train) with internal combustion is particularly useful for the field army.

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* *Vide* Schmiedecke, "Die Verkehrstruppen im Kriege."

It consists of a tractor with trailer, and carries a net useful load of at least 6,000 kilograms, 2,000 of which fall to the trailer, which can be used at the same time with draught animals, and must be strong enough to trail a second waggon. The motor engine of the tractor must develop at least 35 horse-power, and be of the latest pattern. The normal speed ought to be 12 kilometres per hour with iron, and 16 kilometres with rubber tyres. Some of the tractors actually perform up to 30 kilometres per hour. The train must be able to climb gradients of 1 in 7 and be absolutely reliable also in winter. Its average daily progress is said to be about 100 kilometres on level, and about 60 kilometres in mountainous country. To make a complete turn, the trailer must be unhooked, and is then turned round by the attendants of the train: this is rendered easy by the wheels passing completely under the waggon. The tractor turns like any other motor. Nine of these trains can carry the supplies of an army corps which amount to 54,000 kilograms.

The total weight of 9,000 kilograms of the tractor, 7 tons of which are borne by the hind axle, causes a great strain on the roads, and especially on the road bridges in the theatre of war. A *Light Army Train* has therefore been constructed lately, which, with an equal net useful load, brings a maximum pressure 5·5 tons with the hind wheels. Germany intends to adopt this lighter army train within a few years. This will be a great improvement.*

In the so-called internal-combustion-engined *Müller Train*, the motive power is generated in the front waggon by two benzol motors of 75 horsepower each, and is transferred by an electric current to the axles of the six trailers. The frictional resistance of the wheels is thereby removed, making it possible to forward a net useful lead of 30,000 kilograms, at a speed of 12 kilometres per hour even on inferior roads, while the army tractor train is tied to metalled and sound roads. The Siemens-Schuckert and Daimler works have built similar trains for net useful loads of 15,000 and 20,000 kilograms respectively. Trains of this kind will render good service in war, especially when portions of railways are destroyed.*

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* "Vierteljahreshefte für Truppenführung und Heereskunde," 1911, vol. iii.

In addition to these tractor trains we shall use in war fast *motor lorries*, *motor vans—ordinary* and *light*—and *motor buses*, as used in peace for different purposes. The former are motors carrying a net useful load up to 3,000 kilograms, and covering as much as 100 kilometres daily. They can, therefore, forward considerable quantities of supplies and ammunition, and will be most useful where speed and long distances are an object, as for instance, with cavalry divisions.

The ordinary motor vans carry up to 4,000 kilograms at a moderate speed. A loaded trailer can sometimes be attached to them. They are useful in fortresses and at sieges.

The light motor vans are built to carry light goods, and sometimes average the daily performance of motor cars. They are specially useful as baggage waggons for headquarters of staffs, and for ambulance formations; for the latter purpose we can draw now on the hospital autocars, which are more and more coming into use at civil and military hospitals.

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* "Vierteljahreshefte für Truppenführung und Heereskunde," 1911, vol. iii.

Lastly, the motor omnibuses, now available in sufficient numbers in large towns and on country lines, can be used for transporting infantry, staffs, sick, and lightly wounded. Machine guns, too, could be carried by them. Omnibuses are worked by motors of 22 to 35 horse-power, they can negotiate gradients up to 1 in 7, and go at a rate of 18 to 27 kilometres per hour.

All this auxiliary transport we must employ for linking the army with railheads for purposes of supply, and for evacuating sick and wounded. Unfortunately this kind of transport has the disadvantage of being tied to metalled roads, and cannot be used, therefore, everywhere. So long as the troops are marching on such roads, the autos can move right up to them. But when the columns of the army are obliged to use bad, unmetalled roads, transport on the lines of communication must still be carried out to-day by draught animals, and is accordingly slow. In that case we are forced to make extensive use of field railways, or to be satisfied even with tramways, which can be laid practically anywhere. Traction engines may sometimes be used with advantage. They are not tied to metalled roads, and are most perfected in Fowler's system. Fowler's traction engine is built in various sizes, from 40 to 70 horse-power, with solid or liquid fuel. With fully-loaded trailers, the machine climbs gradients of 1 in 10, at a speed of 6 to 7 kilometres per hour on firm roads, and of 1 to 5 kilometres per hour on unmetalled roads or over portions of soft ground. Street locomotives of 40 horse-power can trail loads of fifteen tons at a speed 4 to 5 kilometres per hour. Their daily performance amounts to about 50 kilometres. They are simple to work and absolutely reliable.

On the *battlefield* itself, waggons drawn by horses or mules are now, as then, the only possible means of transport ; and it is hardly likely that it will be ever possible to produce efficient mechanical transport to suit every kind of ground. But there is no need for proving specially that *the strategic mobility of the troops* and *their freedom of action* will grow at the same rate as we succeed in replacing the draught animal columns on the lines of communication by railways and automobiles.

Besides the commercial motor waggons, trucks, and vans, the *private motor cars* and *motor bicycles* are of considerable value in the conduct of operations.

Motor bicycles can cover daily about 200 kilometres, at a speed of 40 kilometres per hour : but they are tied to good roads and require skilled drivers, who must also have some technical knowledge ; they can be heard a long way off, and are not absolutely reliable. We have not yet succeeded in making them thoroughly serviceable for military purposes. Their use will probably be restricted to doing orderly duties on firm roads, and to escorting supply columns, baggage, etc. They are not of much use in the front line close to the enemy, constructed as they are at the present moment. But efforts are being made to improve this machine in every way possible.

The *private motor cars* are built in two types, as *small autos* for two to four persons, and as *tourist autos* for four to eight persons. The small autos with 4 to 6 horse-power and about 300 kilometres radius of action have an average speed of 30 to 40 kilometres per hour, which for short distances can be increased to 80 kilometres. They go easily uphill, and are more mobile in the country and alongside marching columns than the larger cars. A three-wheeled small auto is being constructed. It has the advantage over the four-wheeled types of turning more easily, and of being superior to the motor bicycle as regards safety and reliability in driving.*

The tourist cars, mostly constructed to seat six to seven persons, are designed for average speeds of 40 kilometres per hour, with at least 16 horse-power motors. But the power of these motors is very much greater in many of these cars; they often have as much as 60 horse-power, with speeds up to 135 kilometres per hour, according to their build. Daily performances of 200 kilometres are frequently attained. These cars should have a radius of action of at least 300 kilometres. They must be able to pass over gradients of 1 in 5. As with all military automobiles, their mechanism should be simple and durable; numerous reserve pieces and tools for repairs must be carried with them.

Whenever personal reports or communications between distant headquarters are of importance, or even desirable only, the motor car is a suitable means of conveyance. The car is certainly tied to good roads, but then there is no need for shunning little detours since, owing to its speed, the car can cover in a very short time even long distances. Motor cars are also suitable for conveying orders. These cars make it possible for superior headquarters to remain longer in billets for further work, and yet to be in their new quarters at the proper time. They can also be used for guarding telegraph lines and sometimes signal stations; the small autos especially, can relieve the cavalry very much of orderly and relay duties. The private motor cars are thus on the border between the means of transport and the actual means of communication.

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* "Vierteljahreshefte für Truppenführung und Heereskunde," 1911, vol. iii.

But we cannot warn too strongly against overrating the efficiency of motor cars, and, thus, their military importance. Their mechanism is still very delicate, and easily deranged, when not treated carefully, and when not kept clean. Damage to tyres is of everyday occurrence; barricades, wire entanglements, and similar things, cleverly arranged, may easily prove fatal to motor cars, especially at night. Their use is, therefore, chiefly confined to the roads within safe reach of our own troops, and not too much endangered by hostile inhabitants. The cars will, of course, be also used sometimes in districts threatened by the enemy, but in that case we can never count for certain on a journey being successful. The performance of this kind of conveyance depends on many conditions, which may easily upset all calculations. Their use as a means of communication in the foremost line, or even for reconnaissance, is therefore very limited. We have built armoured motor cars, it is true, which are to be used in enterprises likely to be interfered with by the enemy, and have even armed these cars with light guns and machine guns, but no serious military value can really be attached to these experiments. By being armoured, these motors lose their chief advantages, namely, speed and mobility.

The real means of communication which play a prominent role in modern armies cannot always be relied upon either, in an enemy's country, as they can be easily damaged not only by hostile troops, but also by a population hostile to us. This applies chiefly to the telegraph lines, which of all the means of communication are mostly still in use, and must, therefore, be constantly guarded when liable to attack, so as not to fail us.

In the German war-organization of the *communication service* we can trace three zones.

The foremost zone comprises the cavalry's sphere of activity. In the second zone, Army Corps Headquarters must be connected with their subordinate authorities and with the cavalry; lastly, in the third zone it is a question of connecting Army Headquarters with the army corps and reserve divisions belonging to the army, and with the lines of communication telegraphs. The distance from the enemy, and the degree of mobility demanded by the circumstances, decide the material to be apportioned, which is, accordingly, either of a light or of a more durable nature. The lines of communication authorities finally have the task of establishing the telegraphs behind the army, and of connecting them on the one hand with the field telegraph lines, and on the other with the home telegraphs.

The farther from the enemy communication is established the surer we can rely on the proper working of the mechanical means of communication, while with the foremost reconnoitring units, which are in constant touch with the enemy, and in districts traversed by patrols of both opposing parties, the use of mechanical appliances, especially of telegraph lines, cannot altogether be relied upon. Reports of patrols must, in any case, be transmitted to the reporting centres by men.

As regards, now, the available means of communication themselves, we must first of all consider the use of the actual *telegraph* as the most important of all.

The cavalry is equipped with the *cavalry telegraph.* It is of special light construction and, being of thin wire, can be laid rapidly. The material is carried by the trooper and on the horse. The telegraph patrols are not embarrassed by any waggons, and are therefore able to lay the line towards the rear even from points far in advance. The line is carried over trees or other natural supports; or is put on the ground, where it is now and again fastened on to large stones or other similar objects. To lay the line takes ten minutes per kilometre; at the most twenty minutes, according to circumstances. For transmitting messages, the army telephone is exclusively used: it consists of the receiver for listening, the transmitter for talking into, and the buzzer. Telephone connection can be reliably established up to 15 kilometres, and buzzer-connection up to 30 kilometres. Each cavalry regiment finds a telegraph patrol, divided into two groups, and equipped with its own wire for 7 kilometres' distance; in addition, it is furnished with a receiving apparatus to use on any line found for telephoning, and for hearing any hostile despatches transmitted at the moment by that line. To each cavalry regiment is, moreover, attached a telegraph waggon containing reserve stores, which may accompany the patrol sometimes. The cavalry divisions carry further stores.

The telegraph patrols are used for connecting the various portions of a cavalry division with each other, and the division itself with the nearest field telegraph station when its distance is not too great. It will often be highly important to establish telephone connection with the outpost reserve. Under specially favourable circumstances, it may be possible to connect even some of the contact squadrons with the main body, perhaps by using existing lines. Efforts will also be made to tap and disturb the enemy's telegraph service. Destruction of the enemy's lines may be ordered, too. The patrols of divisional cavalry are similarly employed.

The *corps telegraph detachments* (a company of four sections with the requisite transport waggons) are each equipped with 86 kilometres field cable, 80 kilometres thin wire, 4 kilometres bronze wire, and the necessary apparatuses. The field cable is laid, as a rule, without poles or special insulators; yet poles may sometimes become necessary to prevent the cable, when lying on the ground, from being broken by artillery or cavalry. With such a line we can telegraph and, at the same time, communicate by telephone and buzzer. Each section can establish 18 to 19 kilometres of that line, which is laid partly over trees, partly on the ground, and even through water. The laying takes thirty minutes per kilometre generally. These lines are laid, as a rule, alongside roads, as here they can be guarded better. If the line is no longer wanted, the cable is taken up again. The thin wire, which allows only telephone or buzzer communication, can be laid quicker, and need not be removed. The bronze wire is used for repairing the ordinary telegraph lines when temporarily interrupted.

The function of the detachment is to connect daily the Headquarters of Commands within the Army Corps.

The independent reserve divisions are equipped with the same material, but to a lesser extent, and they connect with the nearest superior headquarters, or direct with Army Headquarters.

Army Headquarters, again, have the *army telegraph detachments*, which are organized similarly to the army corps telegraph detachments, and differ only from them in strength and equipment. They carry only 50 kilometres of field cable, but about 100 kilometres of plain wire, which is laid on poles with insulators. This material must all be taken in the field. The lines laid are of a more permanent nature, as Army Headquarters do not move, as a rule, every day, but at intervals.

Telegraph directions are formed within the lines of communication area. They employ only officials and workmen of the State telegraphs, and are provided with the necessary building material, with an army service corps column of store waggons, and with carriages for officials; they gradually extend the telegraphs with the aid of specially formed building columns. The chief object is to make the personnel and matériel of the field telegraph detachments available again as soon as possible for the field army without interrupting communication.

The whole telegraph service is thus organized to accompany and facilitate operations in a successful offensive war. But whether it will be always possible to establish and change communications in the manner intended seems rather doubtful. The demands made in this respect are exceedingly exacting, and can scarcely be met, especially when retrograde movements become necessary. To take up and relay lines behind an army advancing is always possible; but when we retire, we will often be obliged to abandon the material; the possibility of permanently maintaining telegraphic communication with Headquarters of Commands will then be altogether doubtful; and if we further bear in mind that in vast districts the lines will be threatened by the population or hostile patrols, it becomes obvious how exceedingly important it is to have means of communication not dependent on connecting wire.

This want is met by field signalling appliances and wireless telegraphy.

The former is an optical telegraph with which either sunlight or a powerful signalling lamp is used.

The Morse code of long and short flashes supplies the letters for signalling. The efficiency of the apparatus depends on whether the light of the sun or artificial light is used, on the weather, the country, and on the time of the day. With sunlight we can signal up to 40 kilometres, and with artificial light by day 20 kilometres, and by night 40 kilometres. The average range of the signalling lamp when it is working properly may be assumed as 15 kilometres except, of course, in dense fog or heavy rain. The stations must be established on high points (tops of hills, towers of churches, high houses, etc.) permitting mutual and direct observation. Where such points do not exist nor can be established, signalling is impossible. Sometimes it is, however, possible to throw the flash on to the clouds, and in this way to establish communication between two stations invisible to each other. Long signalling lines can be organized by establishing intermediate stations, each of these stations being furnished with two apparatuses, one for receiving and one for transmitting. Where portions of the signalling line are interrupted, the cavalry telegraph, with which the signalling detachments are likewise equipped, may sometimes be interpolated to establish connection. The cavalry telegraph must also be often laid at the beginning or end of a signalling line, as the stations cannot always be chosen in close proximity to the troops.

Each signalling section is furnished with a pack-horse and specially designed pack-saddle for carrying the signalling apparatus, the various parts of which can also be carried by troopers. It is, therefore, specially suitable for employment with cavalry. It is best attached to reconnoitring squadrons to keep in touch with them, which is otherwise difficult to manage. But this means of communication will be of real value only if the troops themselves are perfectly conversant with it, and if the most practical methods for its use have been worked out by, and become familiar to, the troops. This is not so to-day with the German cavalry. Most of the troops, as well as the leaders, are absolutely unacquainted with the signalling apparatus and its use.

This want of familiarity gives rise to the most absurd mistakes being made in its use, as we could study at the Emperor's manœuvres in 1909. It is also a disadvantage that a technically trained personnel is needed to serve the apparatus, and that the signalling detachments, when they have to work away from the troops in a country threatened by the enemy, want an escort, protecting them, at least, against hostile patrols, but weakening to that amount the troops themselves. Since the cavalry, weak enough as it is already, is here concerned in the first instance, as the intelligence service in the foremost line is one of its chief duties, this is certainly worthy of notice. The saving in orderlies by mechanical transmission of intelligence is hardly great enough to account for the personnel and escort of the signalling apparatus. It becomes worse, as orderlies and relays must be maintained in addition on account of the uncertainty of visual signalling.

Far more useful and applicable is wireless telegraphy. By it communication can be established for long distances, and without visual connection, and it is almost altogether independent of weather and ground. But electric waves extending in the air in all directions, there is the disadvantage of foreign apparatus reading our messages as well. We guard ourselves against this by using cipher, and adopting special measures.

The equipment of wireless stations is very complicated and bulky, and must be carried on waggons. A thoroughly trained personnel is necessary to serve it. Its use with the troops is, under these circumstances, inadmissible. But wireless telegraphy is excellently adapted for connecting the highest commands with each other and with the advanced army cavalry, which should be equipped with wireless stations as a matter of principle. The apparatus taken in the field can safely transmit intelligence up to 200 kilometres, as far as it has been developed to-day. Good service will also be rendered by wireless telegraphy in connecting besieged fortresses with the country outside, and in the defence of coastlines. Probably all countries have therefore established permanent wireless stations in the big fortresses and at other important points. It must further be assumed that all European armies have similar arrangements to our own, and that we can hardly lay claim to being superior in any of these technical departments.

Modern technics have thus tried to ensure the safe transmission of intelligence in all sorts of ways and manners; and though each of the means has its weaknesses and disadvantages, yet, taking them altogether and in combination, they will, in a most decisive manner, contribute to making it possible for the modern armies of masses to be led. Their importance for active operations in war cannot be rated too highly.

These means of communication will materially aid command in battle too. With the size of modern armies and with the extension of battlefields, consequent thereon, it is much more difficult than formerly to ensure the safe transmission of orders and reports; on the other hand, it has become very much more important for proper connection to be maintained with subordinates in action, through the fact that the size of the masses employed makes it very difficult to counter-order measures once adopted. To-day it is therefore still more important than formerly to have reliable means of communication between commanders.

If intercommunication between the leaders, and between them and their troops, is only maintained by mounted men (adjutants, orderlies, etc.), uniform control of an action is possible only within a comparatively limited space. Mechanical communication must therefore step in for longer distances. If the roads are favourable, motor cars can be used for that purpose; sometimes flag and field signalling may be worked; and lastly, telegraph lines can be laid as well on extensive battlefields if the corps telegraph detachments are requisitioned. But the most suitable appliance for such purpose seems to be a telephone that can be easily handled. These considerations have led to *telephone detachments* being formed for headquarters of superior commands; these detachments are equipped with 8 kilometres of a light field cable that can be laid in about twenty minutes per kilometre. The stores are carried on a waggon, which also carries the men. Telephone connection ensures direct personal intercourse between the commands concerned, but this at the same time harbours a certain amount of danger. It is, that superior commanders may feel tempted to encroach upon the sphere of subordinate leaders by meddling with details without being able to judge of what is going on; and that the subordinate commanders may try, by asking questions, to shift to higher quarters responsibility which it is their own duty to take. Demoralization may also easily spread from one command to the other by means of the telephone. The apparatus must therefore be used with deliberate caution, and only by the proper authorities. The advantages it affords are so great, however, that we cannot dispense with its use on the battlefield. Good use can also be made of the telephone detachments when the troops are at rest, either to connect the main body in quarters with the reserve of outposts, or army corps headquarters with the divisions, and these with each other when the corps telegraph detachment is not available.*

The troops themselves, with their present tactics, have also felt the want of telephone connection of the various units with each other and with their commanders. The troops have therefore been equipped with *telephone appliances* as well.

The covered positions taken up by artillery, when the leader is often at an observing station some distance from his command, have made it necessary to connect him with his men by telephone to make it possible for him to direct the fire. But the difficulty of bringing to the knowledge of subordinate officers the orders of the higher artillery commanders in the long artillery lines, especially when stationed in groups, often makes telephone connection between the various commanders a necessity, too.

The infantry telephone is very suitably applied on outpost duty ; and, as personal transmission of orders is almost impossible during an attack, the infantry tries to make the best of signalling flags and telephones in action, as well. But these aids are scarcely to be relied upon.* When the powerful material and psychical effects of an offensive action assert themselves, there is no room at all any more for the special issue of orders demanding deliberation and an altered course of action ; one law prevails then alone : the iron will to beat the enemy.

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* Reliable reports say that a simplification of the field telegraphs is planned, and has already been tried at the Emperor's manœuvres in 1911; namely, the corps telegraph detachments, less the Morse apparatus, have been amalgamated with the telephone detachments of the higher commands to form larger telephone units. These will be at the disposal of army corps commanders, and used by them in sections according to wants. The telephone detachments with the troops are not affected by this reorganization.

It is not the infantry alone which transmits intelligence by signalling flags ; the other arms use this means, too, which is sometimes of advantage for short messages at close distances. The Morse alphabet is used in that case, or the regulation flag signals, or some signals preconcerted for special objects. No great importance can be attached to this mode of communicating ; it is far too slow and troublesome, especially with the rapid movements of cavalry.

Communications by the Morse code are altogether intelligible when they can be deliberately and calmly noted ; a personnel is, moreover, required for this kind of signalling that must be kept in constant practice, but can scarcely be always available when wanted. Signalling flags can often be used with advantage on outpost duty to save mounted and other orderlies.

We must finally mention the latest achievements in technics, namely, *aeronautics.*

The various kinds of air craft, like the motor vehicles, are important as a means of reconnaissance, of communication, and of transport, and they promise to be much more so than hitherto. For the present, of course, *airships* and *flying machines* cannot yet be considered quite perfect for service in war. But it is, undoubtedly, merely a question of time for mechanics to solve that problem finally to perfection.

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* *Vide* v. Bernhardi, "Taktik und Ausbildung der Infanterie," p. 64, etc.

First of all we must mention the *captive balloon*, which has repeatedly turned out well in war, and has for some time been adopted in the German Army in the form of a kite-balloon. It is used to watch and reconnoitre the enemy's position and movements ; it can be used with much effect to throw searchlights and give signals, and it may sometimes render especially good service in observing and correcting the indirect fire of artillery. The English often used it for that purpose in the South African war. The balloon transmits its observations to the ground by telephone. Rising, as a rule, not higher than 500 metres, the balloon can reconnoitre the ground, generally, up to about 7 kilometres. In undulating country this height is usually sufficient for seeing reverse slopes and the ground close behind villages, woods, buildings, etc. In open and rather flat country, with the sun *behind* the observer, 10 kilometres, at least, can be watched with a good field glass in clear weather. It will thus be often possible, when concentrating for battle, or even during the action itself, to supplement, by means of the captive balloon, the reports of the cavalry, and give information, especially on matters the cavalry patrols are, as a rule, unable to ascertain—such as organization in depth of the attack or defence, disposition of reserves and artillery behind cover, entrenchments and masks and similar things.

In fortress warfare the captive balloon can be employed for reconnoitring advanced positions of the defender, and the state of defence of the fortress when the conditions are favourable; and during the artillery combat, for watching our own fire and its effect, and to look for hostile batteries and special measures adopted by the garrison, such as preparations for a sortie, etc. But the long range guns of the defender's artillery will oblige the captive balloon to be stationed very far from the field of attack, thus rendering its duty of observation very difficult. Even during the later stages of the attack, right up to the assault, we cannot reckon to get much intelligence from the captive balloon. But we will often be able to supplement it with advantage from non-captive balloons.

The defender of the fortress will, of course, first of all try from advanced positions to discover the direction of the enemy's approach, and the front he is going to select for his attack. It will be, further, a most important task of balloon observation to find out early the preparations made for the construction of batteries, and the construction of the batteries themselves. Accumulation of siege material, construction of tramways, the laying out of gun and engineer parks, transport of material, and similar measures give us a clue as to the plans and intentions of the enemy. The defender will thus have a chance of disturbing the deployment of the enemy's artillery, and of concentrating himself superior artillery on the front menaced. His own fire, too, and its effect, especially against hidden batteries of the attack, he can often watch from the balloon.

If the balloon is meant for signalling we use flags by day, or differently-shaped bodies inflated with air, and by night we can signal with lights to a distance of 30 kilometres. A signalling balloon, with transparent cover containing an electric lamp inside, serves this purpose. The signals are given as a rule with the Morse code by flashes produced by an electric current.

Important service as the captive balloon may render, its use is, on the other hand, greatly dependent on the weather. Rain, fog, and snow limit still more the horizon, restricted as it is without these; a strong wind may make it impossible for the balloon to be filled and rise. It also offers a favourable target to the enemy's artillery. It can only escape the effect of such fire by coming down and changing its position at once, an operation that cannot be done rapidly enough with a balloon high in the air. Concentrated fire of infantry may sometimes prove highly dangerous to a balloon stationed low.

The captive balloon's usefulness is therefore rather limited, especially during active operations; and if it has rendered good service to the English in the South African war, and to the Spaniards in the Morocco troubles, it may be attributed, on the one hand, to favourable climatic conditions, and on the other to the fact that the enemy did not interfere with the balloons.

Non-captive balloons are of less use still. Being entirely dependent on the wind for direction and rapidity of their movements, they are of some value only in fortress warfare. The assailant can let the balloons fly over the fortress when the direction of the wind is known, to gain thus an insight into certain portions of the ground, and of the permanent works; the defender, when confined to the fortress, may in this way pass intelligence to the world abroad. The Parisians made repeatedly successful use of this means in 1870–71. To-day we may call this a little antiquated method, as the fortress will now, as a rule, be able to keep in touch with its own army outside by wireless telegraphy.

The latest achievements in aeronautics, namely, the *dirigible airship* and the *flying machine*, will be of greater importance for watching in the air than the other two forms just described.

The airships are produced in three different types, as rigid, semi-rigid and non-rigid airships. The dirigibles of the first-mentioned type are called, in German technical language "Gerüst" airships,* and thesecond and third "Prall" airships,† with or without stiffening. These systems are represented in Germany by the Zeppelin airship, by the military airship of the Air Battalion, and by the Parseval balloon. The rigid system of Graf Zeppelin shows an inflexible fish-shaped framework of aluminium angle-poles with wire bracings, enveloped by a linen cover, inside which are a number of balloons filled with gas. Propellers and stearing gear are fixed to the framework; the gondolas, suspended from the framework, contain the motors. In the semi-rigid system the balloon-cover is fastened to a rigid frame, to which are fixed the gondola with the motors, and the propellers. In the non-rigid system the balloon has no stiffening at all; the car which, at the same time, carries the motors and the propeller, is directly attached to a belt of the balloon. In each system the steering-gear is always fastened to the body of the balloon itself, but is served from the gondola.

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* Framework air-ships. † Tightly-fitted air-ships.—TRANSLATOR.

In both the semi-rigid and non-rigid systems air-bags (ballonets) are contained inside the fish-shaped balloon, forward and aft, which in motion automatically fill with air, keeping the balloon thereby tight. If, at a great height, or in hot weather, the gas expands, the air is forced from the ballonets by the gas. These, therefore, act as regulators of the gas pressure. If the pressure is excessive, they automatically cause a valve to open in the balloon, thus preventing the balloon cover to tear. Air may also be pumped by a ventilator into the ballonets, or withdrawn from them as desired. This ventilator is set to work by the airship-motors, or by a separate small motor (Siemens-Schuckert). These ballonets may also be used for steering up or downwards by pressing the air from one ballonet into the other, thus increasing the weight of the balloon at its front or rear end. The balloon is otherwise steered by horizontal planes, which give it an up or downward direction by the way they are placed. Movable weights fixed to the body of the balloon may also be used for steering up and down, steering sideways being effected on the same principle as on water.

All airships, and more especially the Zeppelin ships, can rise, but with great difficulty, to a height beyond 1,000 metres, the loss of gas at great height being considerable, and affecting thus very disadvantageously the duration of the flight.

Otherwise, the Zeppelin balloons are, owing to their size, very stable, have great lifting power, and a wide radius of action. They are, moreover, in so far, safe against injury, as the gas that carries the balloon is distributed among a good number of independent gas-tight compartments; the balloon, therefore, need not necessarily come down, if some of them have been emptied. But these airships have this against them, that they cannot be taken to pieces, but must be shelved in special sheds, and that they cannot be transported. An empty Zeppelin balloon can only be moved for a very short distance, and then only with the aid of a very great number of men. To use these airships we need, therefore, specially prepared anchorages. At the beginning of a war they will go forward from the permanent sheds, established in the frontier districts, and can then return to them after finishing their trip. But when we advance into the enemy's country, we must carry portable sheds if we wish to continue using these ships. And so these have already been provided; they can be taken by rail, and have proved their worth at trials in manœuvres.

Compared with the rigid airships, the semi-rigid and non-rigid airships have considerable advantages. The semi-rigid balloon is quickly mounted, the gas being applied direct; owing to the rigid frame or keel to which it is attached, it possesses comparatively great solidity; it can be taken to pieces and moved about, and therefore be used without requiring a shed. The rigid keel, however, which can be taken to pieces, makes the ship need several waggons for transport. The size of the ship, as used, so far, in Germany, prevents it having the carrying capacity or the wide radius of action of a Zeppelin ship. But its present measurements are not at all final, and may easily attain those of a Zeppelin balloon, as matters stand to-day in the world of technics. The Parseval airship is still easier to get ready and to dismantle than the military semi-rigid airship, and can be transported on two waggons. The disadvantage of both these systems is that any serious injury to the cover will infallibly bring down the balloon, since the gas is not distributed in numerous independent compartments as in the Zeppelin. Still, both these kinds of airships, semi- and non-rigid, can directly accompany the troops, and be used anywhere. This renders them always much more useful for military purposes than Zeppelin's system, which is, moreover, much more dependent on the weather, and has yet to prove its military worth.

It is, of course, an advantage if sheds can be provided sometimes for semi-rigid and non-rigid airships, as we then need not empty and refill the balloons again when in daily use. Portable sheds, taken into the field, will benefit these airships too.

They all can be used to-day for reconnaissance if the conditions are favourable. But they are not yet absolutely serviceable in war, for the various reasons stated.

First, and above all, we have not yet succeeded in giving them sufficient velocity of their own. In the higher regions of the air (1,000 to 1,500 metres) to which they must ascend to be in some measure safe from hostile fire, the wind is generally very much stronger than closer to the earth. This wind, if it is a contrary wind, must be overcome, and the ship must, besides, have left enough balance of its own velocity to make progress against the wind. This requires a surplus velocity over the wind of 4 to 5 metres per second.

The force of wind has been ascertained statistically, and from it has been calculated, that a ship with a speed of its own of 20 metres per second, is independent of the wind on 85 per cent. of the days in one year, when it can therefore be used. With a speed of 15 metres per second this percentage is reduced to 58 per cent., and for ships with an average speed of 12 metres per second to 40 per cent. We must, besides, deduct 25 per cent. of the days when rain, snow, fog, or thunderstorms prevail. The weather need not always make it directly impossible to sail, but the trip is not likely to succeed as a rule. The journey will be slower, sometimes the necessary height will not be attained, and distant view from the gondola will be limited, or even shut off altogether. But there is then no object in starting at all.

Taking all this into consideration, a balloon with a speed of 20 metres per second, could only be used during 234 days of the year; but the greatest speed hitherto attained was that of the military airship "III" with 16·40 metres per second. It is therefore absolutely necessary to increase the speed of all war balloons to at least 20 metres per second; and it may be expected that the art of engineering will succeed in obtaining this speed by a suitable design of motors, a favourable form of the ship, decrease of friction, and increase of propelling power.

Auto-speed being thus the basis for all really serviceable designs, yet quite a number of other points demand some further attention. The balloon and all its parts must be of sufficient durability for active service, and be absolutely reliable in their work. It must next be possible to move at great heights (over 1,200 metres) to escape as far as possible the enemy's artillery fire. We must further be able to fight successfully the enemy's airships, and ward off the hostile aeroplanes and their attacks. Against balloons, superior power of manœuvring and speed will be of decisive importance, as in that case we can rise higher than the enemy, and are able to attack him from above. Better armament will also give us superiority. Infantry fire will, as a rule, hurt the garrison only ; small holes in the balloon cover, caused by rifle bullets and small splinters of shell, automatically close again through pressure of the gas. But we must make it possible to hit the airship from above by fireballs, so as to ignite the cover of the balloon and bring about explosion. It would be most important if we could fire such projectiles from rifles too. We have no experience at all, of course, in that respect, nor do we know of any experiments in that direction worth considering. Yet we must not underrate this side of the question, as there will be severe combats in the air without any doubt whatever, giving the party, victorious in these combats, a very great advantage in its operations over the enemy it has beaten in the air. The side which commands the air is able to trace the movements of the enemy's armies, and force them to use the night sometimes for marching to escape the hostile eye to some extent. We must, lastly, also keep in view the possibility of developing the airships in such a way as to make them carry considerable loads ; they can then overwhelm with shells from above localities occupied by the enemy or large assemblies of troops.

The requirements, which, apart from the necessary auto-speed, must be exacted from a dirigible war balloon may from all we have said be summarized somewhat as follows: the ship must be easy to steer and manœuvre; it must be able to ascend rapidly to great heights, and move at heights of over 1,000 to 1,500 metres for some time, even when the atmospheric conditions are unknown, so as to escape hostile attacks and make successful attacks itself; it must be equipped with effective means of attack; it must have a great radius of action, which, apart from speed, depends also on the quantity of fuel carried; it must allow wireless telegraphy to be used without danger, so as to remain in constant communication with the authority the ship was despatched by; it must be indifferent to partial damage, so as to continue on duty even after an action or in bad weather; it must be able to carry explosives, and possess appliances to use them in the proper manner; it must, lastly, be moved by absolutely reliable and efficient motors. At the same time, it must be possible to take the ship to pieces easily, to transport it overland, and to put it together again, so that in war such ships may be attached to headquarters of superior commands at least.

We need not trouble ourselves about the formation of squadrons of some size until the defects have been removed, which so far render difficult or impair the efficient use of these vessels on active service. But there is no doubt whatever in my mind that within a measurable time we will be obliged to form such squadrons. It is therefore highly important, from a military point of view, that steps should be taken to advance matters vigorously in this department. We may thereby gather quite new points of view for the conduct of war.

In addition to the dirigibles, the *flying machines* must be developed too. In France, which has taken the lead in this matter, and maintains a decisive superiority, greater importance is even attached to them than to the dirigibles. But when considering the favourable results obtained there, we must bear in mind that the trials made there were on the whole more of a sporting nature, and did not always take place under the pressing conditions of active service. If these were added it would probably be shown, that even the highly developed French aeronautics do not yet come up to the manifold requirements demanded from a machine for use in war.

So far, these machines are much more dependent on favourable atmospheric conditions than the dirigibles ; so far they must be kept scrupulously clean and in repair, to work in some measure properly ; so far they do not at all fulfil yet the necessary requirement of keeping their balance automatically in all situations. Flights when the wind is going at the rate of 10 metres per second and more are exceedingly difficult, and as good as impossible. Even when the wind is going 8 metres per second trips are not often undertaken. But trained flyers can even now ascend and land on any open field with something like firm soil ; and we have also succeeded in building types of flying machines, especially biplanes, which can carry two persons just as safely as one. This is absolutely necessary from a military point of view, for, the man guiding the machine has his full attention absorbed by the machine itself, and is positively unable to attend to any other task such as would be required by military exigencies.

The principle of these machines, which are heavier than the air in which they are to ascend, is based on the dynamic pressure of the air. In the place of a body filled with gas, an arrangement of wings, which presses a great quantity of air with much force downwards, is to effect the ascent. By this means a reaction is produced, which lifts the flying machine up according to the amount of power expended.*

The flying machines we can imagine to be constructed according to three principles fundamentally differing from each other, namely, as kite-flyers (aeroplanes), as screw-flyers,† and as wing-flyers.‡ For military purposes we are concerned with the aeroplane alone. All flying machines in use hitherto are built after this system. By inclining the steering planes the machine is raised into the air when sufficient forward motion is produced by the motor; the ascent being effected, the steering planes are again adjusted horizontally for further flight. Useful machines after the other systems have, on the other hand, not yet been produced at all. But it can be said, that the future belongs to them, because the aeroplane is a very primitive instrument, hardly capable of further improvement.

On the part of the military it is expected that the flying machines may be usefully employed for transmitting intelligence, for reconnaissance, and for attacking dirigible airships.

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* Nauticus, 1909.

† Schraubenflieger.—TRANSLATOR.

‡ Schwingenflieger.—TRANSLATOR.

The flying machines will, without doubt, be useful for keeping two separate columns in touch with each other, especially of cavalry; or for transmission of orders to detached bodies such as reconnoitring squadrons; or for rapid conveyance of important despatches to the rear. It must be left an open question whether they will prove a practical means of reconnoitring the enemy. In France they pretend to have gained good results in that respect. The stability of the flying machines, it is true, permits of observation, but their speed considerably militates against it. It will be difficult to observe from a great height, and when the machine is flying low the enemy's rifle fire is, after all, a great danger, though its speed makes it difficult to hit the machine. If the flyers should, nevertheless, prove suitable for reconnaissance, it would aid the cavalry greatly, and reconnaissance by flying machines during an action or battle may also gain much in importance.

France looks upon the flying machines as specially suited for the task of fighting the airships. She has designed already projectiles for that purpose, the so-called flèches aëriennes. The flying-machines being able to ascend even now to considerable heights (10,000 feet and upwards have been attained), they can pass *over* the airships, and attack them from above with explosives. This question needs serious consideration; the development of flying machines for military purposes may prove altogether of greater importance than Germany seems to think. The machines must, of course, satisfy certain demands necessarily made from a military point of view to be of any use in war.*

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* *Vide* Nauticus, 1909.

First of all, it must be possible to ascend without any artificial arrangements for starting, such as now used at aerodromes. Ascending and landing must not depend on the ground, and be possible under all sorts of most difficult conditions. The machine must allow another man to be carried in addition to the driver, and also a quantity of explosives necessary for attacking dirigible balloons. It is further requisite that all parts of the machine are of the simplest and most durable kind, especially the motor, whose failure to act would render the machine at once useless, and at best allow it to come down at a slide; that there is sufficient stability and, if possible, automatic preservation of the balance; and that the machine can be easily steered both vertically and horizontally. Lastly, the machine must have great speed, and a radius of action long enough for military purposes. It must besides, when packed up under service regulations, be easily and rapidly transported, and be fitted together again under service conditions, and be ready for military use in the shortest possible time. A wide field is therefore open to the skill of technics; let us hope it is equal to its task.

The German slowest flying machines, some biplane types, have a speed of 60 kilometres per hour—that is to say, 16·7 metres per second. The quickest monoplanes cover some 140 kilometres per hour, which is equal to a speed of 38·9 metres per second. If a flying-machine has a speed of 20 metres per second, it is, as a rule, safe enough in its flight to resist gusts of wind. This speed is the least that must be demanded. Heights of 400 metres above ground can be maintained for some time by almost any kind of flying-machine now in use. It is difficult to fix a minimum of height. The machine must fly high enough above ground to be safe in some measure from rifle fire, but not so high as to render watching the enemy impossible. The size of the desirable radius of action depends on the circumstances of each case too. We may be satisfied, as a rule, if distances of 300 kilometres can be covered, which, at a speed of 20 metres per second, corresponds with a flight of four hours' duration.

I must refer here briefly to another matter intimately connected with aviation, I mean photography. More than once have hostile positions and portions of ground been successfully photographed from balloons at great distances, giving a fair idea of what these objects looked like. Photographs from non-captive balloons and airships especially give more satisfaction than those taken from captive balloons. The horizontal topography of the country photographed can be exactly ascertained without difficulty, but the representation of the features of the ground causes great perplexity, the light acting on the various objects in so many different ways that only a practised eye can read from these pictures the differences of level. The photograph is, moreover, a perspective view, showing the more distant objects foreshortened, and cannot, therefore, be used directly for military purposes. The photographs taken must first be reprojected orthographically as a map and to scale. To prepare these maps rapidly and in simple form is a task which photogrammetry has to solve. But it seems to me that this method of reconnoitring can never be of much use during active operations, while it may be of some importance at sieges or in fights for positions.

The modern explosives, on the other hand, will acquire great importance in war. That they are of considerable use for destroying railways, and in aerial warfare, is apparent from our previous discussion. Apart from rifles and compressed air guns, they are the real weapon in aerial warfare, and will be always so for certain other purposes. But in fortress warfare explosives will also be of much greater value than formerly, since artillery is no longer able to get the better of the fortifications. The assailant must use explosives extensively, as we shall see in another chapter, to push his works rapidly forward and destroy all bomb-proof cover of the defenders. In the form of hand grenades they have developed already into a separate arm, which has established its right of existence in fortress warfare, and may also become useful in a war for positions. In the preceding chapter we have shown that they came into use again in the Russo-Japanese War. The Prussian grenadier, who derived his name from the fact that he threw hand grenades, will revive in the future. Let us hope that, equally efficient, he will acquire equal fame as old Fritz's grenadiers, who, it is true, did no longer throw hand grenades, but formed instead a *corps d'elite* that never failed.

CHAPTER V

THE IMPORTANCE OF CAVALRY*

Altered importance of cavalry, p. 190—Reasons for the decline of cavalry, p. 191—Chances of charging, under modern conditions, p. 192—Wrong views on the main duties of cavalry, p. 193—Importance and nature of reconnoitring and screening, p. 194—Enterprises against the enemy's lines of communication, raids, p. 198—Objections to the usefulness and feasibility of raids, p. 199—Feasibility and usefulness of raids, p. 201—Participation of cavalry in battle, p. 202—Pursuit, p. 205—Causes of the rarity of vigorous pursuit by cavalry, p. 205—The cavalry in the Battle of St. Quentin, p. 207—Covering retreat, p. 210.

THE fire of modern rifles and guns has deeply affected the tactics of the three arms, as we have seen. While it has altered only the form of fighting of infantry and artillery, and the manner of their tactical employment without touching the importance of both these arms as a whole, and within the army, it has had a far greater influence on cavalry. Not only the *tactical formations* used by cavalry in action have changed, but its *employment* is *altogether different*. Whereas its importance rested in former times chiefly on its decisive participation in battle, its importance to-day is founded on *strategic* action. But in that sphere of action the value of cavalry has extraordinarily *increased* just owing to these very conditions of modern times, as will be seen, if we examine them with an unbiassed mind.

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* *Vide* also v. Bernhardi, "Unsere Kavallerie im nächsten Kriege," and "Reiterdienst."

The opinion is generally held, it is true, that the cavalry has lost almost all its importance in the face of modern arms and armies of masses, and this opinion is apparently confirmed by the experiences of the latest wars, in so far as indeed the cavalry has played a very inactive rôle in modern campaigns, with the exception of the South African War; but this circumstance cannot at all be considered decisive for the future, for they were quite peculiar conditions which caused the cavalry to make such a poor show in recent times. One main point above all was of decisive importance for this.

The effect of modern firearms, with all its consequences, has, as we have seen,* caused occasions for successful charges against firearms to be of very rare occurrence in the latest wars, and they will be rarer still in future. Such charges have, however, positively ceased to be of decisive importance in battle, by reason alone of the comparative small numbers of cavalry. Owing to the enormous size of modern armies and the extent of the battlefields, a successful charge of even so large a body as a cavalry division could no longer bring about a decision by itself. But the cavalry has nevertheless hitherto stuck to the fiction that its relation to the other arms was still similar to what it was formerly—that an action of the three arms combined was possible even to-day, as in the days of Frederic and Napoleon. The cavalry looks now, as it looked then, upon a charge in battle as its paramount duty; it has almost deliberately closed its eyes against the far-reaching changes in warfare. By this it has *itself* barred the way that leads to great successes. The responsible military authorities have failed in the same way. Very reluctantly the cavalry was armed with firearms, at first even with quite useless weapons, and it is but very recently that the German cavalry got an efficient rifle; its use is still looked upon as quite a subordinate matter. The tactical exercises of cavalry divisions are still carried out as of old; we still cannot bring ourselves to enter heart and soul upon the tasks imposed on us by the new order of things. Superior commanders, too, are still imbued with obsolete ideas, and employ cavalry according to these ideas. The Emperor's manœuvres in 1909 furnish an interesting example of this. Cavalry owes its decline to all these circumstances. But whether it will gain in future the place due to it will, above all, *depend on whether the rank and file will resolve* with open eyes *to break with the ideas of the past*, and *devote themselves to the tasks of the present without reserve.*

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* Vol. I., Book I., Chapter II., p. 38, etc., and Book II., Chapter III., p. 122, etc.

The German cavalry need not, for all that, give up the hope of successfully charging infantry and artillery. Anyone who wished to deduce from my remarks that I thought the time for such charges was a thing of the past would completely misunderstand me. I am rather of opinion, and have always stood up for it, that modern infantry will sometimes present a favourable object for a charge, especially when it is a question of infantry of the second and third lines. If such infantry is demoralized by the dissolving influences of modern action, is out of hand of the commanders, and no longer fires deliberately, it will easily enough become a prey of a bold cavalry charge from various directions if the ground offers at least some advantages. Such situations are sure to arise even to-day, especially in pursuits. The enemy's artillery, standing far behind the foremost fighting line, can also often be attacked by cavalry, though not in front, yet from the flanks, and especially in rear, if the enemy has used up his reserves, or, as a modern writer has it, if there are no reserves at all, and have been replaced by "motors full of ammunition."*

Obsolete I only hold to be that opinion which thinks that the *main task* of our cavalry is to co-operate directly with the other arms and to charge in battle; which desires to subordinate all action of cavalry to this task, treats fire-fight of cavalry merely as a last resource, and would like to restrict the strategic freedom of that arm by constant deference to its possible employment on the battlefield.

If the cavalry takes the field in a future war with notions of that kind, it will *certainly not* give us that advantage which we otherwise can expect, and have a right to expect, from it.

The relations of cavalry to the other arms, and altogether to the conduct of war, have, as a matter of fact, completely altered. *An action of the three arms combined in the old sense*, as is still hovering before the mind of our cavalry soldiers as a delusive ideal of bygone times, is *no longer feasible at all.* The participation of cavalry in the decisive action of infantry and artillery is no longer necessary. All the more important it is to be absolutely clear on the tasks which a future war will demand the cavalry to solve, and on the mode by which these tasks must be solved. The superior commanders and the cavalry itself must learn to deal with these problems, and prepare themselves to carry them out, if the cavalry is to continue to be a useful instrument of war in the future.

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* "Der Krieg der Gegenwart," *Deutsche Revue*, Januarheft, 1909.

Reconnoitring and *screening* must be mentioned first of all in this connection. Both have eminently gained in importance under modern conditions. Advantageous as it is to have as accurate and as early information as possible on the enemy's measures, and to screen our own concentrations and movements with the object of surprising the enemy and increasing thereby the chances of success, the advantage will be all the greater when great masses are concerned. The larger the armies are which are being moved, and the longer it therefore takes to concentrate them or change their direction of march, the more important it becomes to reconnoitre in time, so as to be able to initiate early enough the measures which may have become necessary through the facts ascertained by reconnaissance. Modern arms indirectly influence reconnaissance in so far, too, as, owing to the long-range and effective indirect fire of artillery, we must deploy for action sooner than formerly. It will be very exceptional for superior commanders to reconnoitre personally before such deployment. They are thus almost entirely dependent on the results of cavalry reconnaissance, not only for their operations, but also for their dispositions for battle. This makes cavalry reconnaissance all the more valuable, but also calls for greater efficiency of that arm.

The cavalry must precede the armies as far forward as possible, to beat the hostile cavalry and push it back vigorously, so as to allow our own patrols to approach rapidly the hostile columns and discover their movements. So long as an efficient hostile cavalry is in the field, our own will be hampered in all its enterprises, and accordingly obtain little information. We must further bear in mind that the enemy's cavalry may decline to fight with cold steel, using the carbine instead, and be supported in this action by detachments composed of all arms. The cavalry must therefore be prepared to undertake independent operations of an extensive nature, and be able to beat by dismounted action strong hostile forces, or to turn them. If it can do both, then, and only then, will it carry out its object.

Offensive power is, however, not enough for cavalry; it must have also learned to push out its reconnoitring bodies rapidly and systematically, and to send back as fast as it possibly can to the headquarters concerned the early information it has obtained. Great horsemanship, combined with daring boldness and vigilance of patrols and reconnoitring squadrons, are necessary to attain these objects; all mechanical means must, moreover, be used to promote rapidity of gaining and transmitting intelligence of decisive importance. The army cavalry must therefore be equipped and conversant with wireless telegraphy, telephones, signalling apparatus, and flying machines, the uses of which have already been discussed in another chapter.* It may also be advisable to use signalling balloons, with the object of conveying to the reconnoitring squadrons orders and other communications. If we make such a balloon ascent at a certain hour of the night from a preconcerted spot, the reconnoitring squadrons and other detached bodies will be able to discover it easily, and read the flashes given by the Morse code. If this system answers well at trials made in peace-time, each cavalry division could be equipped with a small balloon of that kind. It would render good service in clear weather. The cavalry must also keep as much as possible in constant touch with any dirigible airships that may be available. The airships must arrange their action so as to work ahead of the cavalry, and furnish it with intelligence about large concentrations of the enemy or their approach, to enable the cavalry to adopt its measures accordingly. These ships must therefore beat the enemy's airships and flyers, and start early to meet them with that object. To insure co-operation in reconnaissance on land and in the air, it will often be advisable to place the cavalry and airships under one uniform command. The intimate co-operation of these two arms will best insure success. We will also be obliged to attach to the cavalry specially designed guns to support our airships in their fight against those of the enemy, or to fight them independently.

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* Vol. I., Book II., Chapter IV., p. 186.

Early reconnaissance is particularly important to that party which has resolved to remain on the *defensive*, strategically or tactically. That party has then surrendered the initiative to the enemy, and must conform to his will. It cannot arrange for suitable measures of defence until sufficiently informed as to the grouping and main direction of attack of the enemy;

it runs the risk of being too late with these defensive measures, if it does not receive correct intelligence about the enemy's measures in ample time. At the same time, it will be its concern to screen the position of its own reserves, so as to deliver a counter attack by surprise. *The assailant*, on the other hand, who seizes the initiative and imposes his will on the enemy, is in the first instance interested in *screening* his concentration, and his main direction of attack so as to act by surprise, and thus make it impossible for the enemy to adopt his counter-measures in time. But it is also desirable for him to gain a knowledge of the strength and grouping of the hostile reserves, so that he may not come unexpectedly on stronger forces than he had anticipated. In this way the cavalry has always to face the double task of simultaneously reconnoitring and screening; and it will often have to decide on which of these activities it has to lay the greatest stress. When screening, it will, above all, be a question of warding off with firearms any hostile attacks, because effective screening is generally only possible by defensive action in combination with ground. Sometimes only when advancing must we try to screen offensively by boldly attacking every hostile party, down to a single patrol, pushing them back, and endeavouring to capture the enemy's despatch-riders. If screening is to be supported by airships and flyers, it can be only done offensively by attacking the hostile aerial fleet and trying to render it harmless.

When we are reconnoitring, and not screening, we must always try to come to close quarters with cold steel, as we wish to attain our object quickly, and must therefore decide an action rapidly, and that can only be done by charging. In case of need only, when there is no other course open, must we have recourse to the carbine. Since both parties have an equal interest, as a rule, in gaining rapid success, we are justified in assuming that during the first period of a war there will be great cavalry charges, and that only that party will have recourse to firearms which, from experience, has become aware of the enemy's superiority when charging; the party using its firearms must then be beaten by dismounted action as well. From this it follows that cavalry, intent on carrying out its duties, must also prove superior in dismounted action, so as not to lose in fire action the superiority it has gained with cold steel.

In addition to reconnoitring and screening, the cavalry must at all cost *act on the enemy's lines of communication.* This is of the utmost importance in modern war. The larger the armies, the less they are able to live on the country; the quicker and the further the firearms shoot, the more ammunition will be spent. In equal measure grows the importance of supplies and of the lines of communication; the interruption of regular supplies may prove then all the more fatal. Here, therefore, is a field for the cavalry to achieve far-reaching successes. Even tactical decisions may be affected, at least indirectly, by the enemy's supplies of ammunition being cut off directly in rear of the battlefield.

In view of these dangers threatened by cavalry, both parties will take pains to guard in sufficient strength with troops, at least of the second and third lines, those communications which may be endangered.

It will therefore not be easy for the attacking cavalry to carry out its mission. It will not only have to beat the enemy's cavalry which will certainly oppose it off the field, but it must also operate independently on the flank and in rear of the enemy for days, and perhaps for weeks, entirely separated from its own army, and be able to capture by swift attack any supply columns on the march or while parking, as well as depôts on the lines of communication. The cavalry must therefore be specially equipped for these duties, and have substantial fighting power, not only mounted, but above all dismounted. If its own strength is not sufficient, cyclists must be attached to it, because a *combination of cavalry with cyclists* will undoubtedly prove altogether extremely effective.

Fears have been expressed that enterprises against the enemy's communications might jeopardize the participation of cavalry in battle, and thus, of course, its participation in pursuit or covering retreat as well. The German cavalry training, too, warns, as it were, against these kinds of enterprises,* because the cavalry might be diverted from what is still considered its paramount duty—namely, charging in battle. Views forming the basis of such regulations are in no way in harmony with the requirements of modern war, and completely misjudge the relative value of employing troops. I think, moreover, that the objection of raids diverting a well-led cavalry from its proper duties is perfectly untenable. If the raid is made in a decisive direction—that is to say, in a direction in which the commander-in-chief has decided to bring about the final issue; if the cavalry commander is kept constantly informed of the intentions of general headquarters and on the general situation, which seems feasible by wireless telegraphy or by some other means, he can easily move towards the enemy's army when the crisis is approaching, and appear on the day of battle on the flanks and in rear of the adversary like Stuart at Gettysburg. The raid itself will lead him in the decisive direction.

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* "Exerzier Reglement für die Kavallerie," paragraphs 527 and 395.

He who wants to keep the cavalry always in close proximity to the flanks or even behind the battle-front, will never derive any advantage from that arm under modern conditions; the cavalry will in that case, like in all recent wars, except the American Civil and South African Wars, stand idling about on the battlefield vainly waiting for its chances to come. Freedom and movement together with every kind of action are the life and soul of that arm, which is bound to decay if it does not succeed in adapting itself to modern requirements.

The cavalry in the North American War of Secession, approaching its tasks with an unbiassed mind and not being hampered by tradition and routine, soon found the right way for great activity. The South African War, too, is very instructive in this respect. General Buller, who seems to have been still imbued with perfectly antiquated ideas about cavalry, always wanted to have that arm on his flanks to cover them, even when they were not at all threatened; he thus hampered all freedom of action of cavalry. The consequence was that his cavalry did nothing. General French, on the other hand, took the opposite stand. Extensive raids around the enemy against his flanks and rear was the principle of his action, and he would have done even more than he did in this direction, had not General Roberts repeatedly clipped his wings and held him tight, and had not the horses completely broken down. But the fundamental ideas of his cavalry leading were undoubtedly right, strategically as well as tactically. A warm adherent to cold steel and ever ready to charge, he still knew the full value and importance of the firearm, and never hesitated to attack dismounted whenever it suited the case.

But it has not only been asserted that raids against the enemy's lines of communication will jeopardize the cavalry's participation in battle—it has been further asserted that these kinds of enterprises are not at all possible under modern conditions. The numerous lines of communication defence troops, and the extensive telegraphic system of European theatres of war, would make it always possible to concentrate superior forces against such cavalry and paralyze its action. I think this view is wrong.

Certainly, at the beginning of the war occasions for such enterprises will be rare. When the French army is concentrating on one line from the Belgian to the Swiss frontiers, we cannot dispatch a cavalry corps on the French lines of communication. But when, during the course of the war, different and separate army groups will be forming—as will always be the case—a suitably-equipped cavalry will certainly be able to operate against the enemy's flanks and rear. If we study the campaign of 1870–71 from this point of view, we will not be long before we arrive at this conviction.* Of course, the troops employed on such a raid must not only have considerable fighting power, but must also be equipped with columns and trains capable of moving as rapidly as the troops themselves, making them, for some time at least, independent of the country, as well as of their own lines of communication. By destroying the enemy's railway and telegraph lines, as well as by spreading false intelligence, the raiding-corps must try to keep the enemy uncertain about its activity, and render his concentration for a counter offensive difficult. By demonstrative movements and rapid marches, sometimes carried out at night, the corps must deceive the enemy, escape his countermoves, and unexpectedly appear where the blow is least expected. It is, of course, altogether presumed that these demands are met when cavalry is employed independently in this way, as well as in reconnaissance and pursuit. If these demands are satisfied, the raids will prove feasible too. Their importance is generally underrated. I do not only think them possible, but a downright necessity, as we shall see when we deal with the strategic operations ; and I believe that raids will not only favourably influence the decisive issue in battle, but also lead the cavalry in a favourable direction on the battlefield itself.

At the *final issue of battle* the cavalry divisions can also take their due share only if they are able to act with firearms in considerable strength. There being no longer any question of cavalry co-operating constantly and closely with the other arms in the way it is still done with infantry and artillery, the cavalry, combined into large masses, must try to intervene from the flanks of the line of battle, and to become effective chiefly by the direction of its attack. That must be made against the flanks and rear of the enemy. Its mobility enables the cavalry to envelop the enemy's flanks and penetrate to his rear. It must not be afraid of abandoning, then, altogether its own lines of communication for the time being. It will always be able to regain them again. If it is opposed by the enemy's cavalry, that cavalry must be attacked without hesitation, beaten, and pursued with portions of the force. This is presumed for all further enterprise. If it is successfully accomplished, then the road is open to great achievements. The moment has now arrived where the cavalry can render invaluable services to the other arms, though not in direct co-operation, by drawing upon itself hostile troops, and preventing them from intervening in the decisive issue. The victorious cavalry will first employ its artillery, machine guns, and, if need be, its carbines against the enemy's flanks, reserves, artillery, and ammunition columns, and use every opportunity for acting offensively, mounted and dismounted, without, however, engaging in an obstinate fight against superior numbers. Its mobility enables it here again to get away, and rapidly reappear at another place. The cavalry must perpetually try to threaten and damage the enemy where he would feel it most, but must reserve its main fighting power for the moments of the crisis. At these moments it must not mind heavy losses if it can effectively contribute to gaining victory. It will resolutely attack and push back in good time the detachments the enemy has pushed forward for protecting his flanks and rear, and thus have the road clear when the final crisis arrives. It is then of great consequence that the cavalry should act effectively at all costs, and to intervene in the decisive combat itself by charging, if that can be done, otherwise by fire action.

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* The German General Staff, too, seems to share my opinion. When discussing the great Russian raid under Mishtshenko against the lines of communication of the Japanese, the General Staff holds my views that the second period of the war in 1870–71 shows a whole number of cases where such raids could have been carried out successfully, and expressly emphasizes that the failure of the Russians was no proof against the feasibility of such enterprises in future.—(*"The Russo-Japanese War : German Official Account, the Raid to Yin-kou, and the Battle of San-de-pu,"* vol. v. Hugh Rees, Ltd.)

The cavalry of *the defence* will first of all try to capture the assailant's artillery or to engage it, paying at the same time special attention to his heavy artillery. It will throw itself on the attacking infantry as soon as that is preparing for assault, which can be noticed by the increase of fire and by the resolute advance of reserves that may be available still. It depends on circumstances whether the cavalry makes use of the charge here or of dismounted action. It will also have to intervene sometimes in relief of its own infantry when that seems to grow weary. The cavalry of the *attack*, on the other hand, will not only act offensively against *those* portions of the hostile artillery which are firing on the attacking infantry, but do all that is in its power to prevent reserves from intervening in the fight, and, if possible, to bring to bear reverse fire on the defensive line itself. Occasions for charging infantry will be rarer for the cavalry of the attack than for the victorious cavalry of the defence.

Another particularly important task for cavalry is to delay hostile troops hurrying to the battlefield from behind or from the flanks, and to prevent their timely arrival on the battlefield. Mobility and carbine will here be of great use to cavalry too.

Of great importance is, lastly, the co-operation of cavalry *in pursuit*. Direct pursuit in front, as will naturally follow from the nature of the fight, must, of course, be chiefly left to the infantry and artillery, armed as they are to-day, because the bullet reaches further and surer than the swiftest charge. But to pursue along the flanks of the enemy is the share of the cavalry, which must try to forestall the hostile march-columns, break into their flanks, and head them off, especially at places where the ground is favourable for causing delay to the flying enemy. The victory having been bought with streams of blood, the time has now come for reaping the harvest, by inflicting on the retreating enemy losses twofold and threefold the amount we have suffered. Fire and cavalry charges—where the demoralization of the enemy allows it—must do here equal damage.

The fact that vigorous pursuit was never undertaken by cavalry in recent times, at least not in European theatres of war, has led people to think very often that the idea of cavalry pursuit is mere theory, and can never be turned into practice. I do not share this opinion, but think that this fact is simply due to the manner in which cavalry was employed, and to its defective equipment for operative purposes.

During the wars of Frederic's time, when the cavalry fought on the flanks of the infantry and could thus easily have initiated pursuit on the flanks of the enemy, it was tied to the army owing to the system of supply, and was not prepared for independent operations. After battle it was as much exhausted, as a rule, as the other arms; and after victory was more concerned with rallying, reorganizing units, and feeding horses, than with pursuing. It rarely happened, therefore, that the enemy was vigorously pursued directly after battle.

In Napoleon's time the armies were organized into smaller units, corps, and divisions, and the cavalry was partly apportioned to these units, and partly retained in reserve behind the battle line, so as to be able to co-operate with the other two arms along the whole front at the given moment. It was very difficult, as a rule, to start from here a vigorous pursuit along the flanks of the enemy, and it was the more difficult because the generals themselves never contemplated anything of the kind in most cases.

When, afterwards, improved firearms drove the cavalry more and more from the common field of action, nobody thought, as we have seen, of drawing the necessary conclusions from this fact, but everybody stuck to the old notion of battle-cavalry. The cavalry was held back until the final crisis, in positions which afterwards made pursuit as good as impossible; and when the moment arrived to use it, it could not be done, as a rule.

The idea of pursuing with cavalry hardly ever entered the mind of any leader, particularly of modern times; the cavalry, even when it was on the spot, was not launched. I personally met with such a case. At Weissenburg a numerous and fresh cavalry was standing on the Geisberg after its capture; everybody was gazing at the retreating enemy, until, in accordance with the praiseworthy customs of peace, the "Halt" was sounded and the order issued to move into bivouac. There was, therefore, not only no pursuit at all, but all touch with the enemy was completely lost as well. It is further known that at Wörth the 4th Cavalry Division was even forbidden to move to the battlefield. It was not until evening, when all chances had been lost a long while ago, that it was ordered up, from a long distance in rear, to follow in pursuit; its performance next day was, of course, next to nil.

Of special interest in this respect is, again, the employment of cavalry in the Battle of St. Quentin. On the right of the battlefield were standing the Guard Rider Regiment and the 17th and 18th Uhlans. Behind the fighting line of the right were distributed, in addition, three squadrons of the 9th Hussars, seven squadrons of the 3rd Reserve Cavalry Brigade, the 2nd Guard Uhlan Regiment, and three squadrons of the Guard Hussars—in all, twenty-nine squadrons. On the extreme left were Dohna's Cavalry Brigade (8th Cuirassiers and 14th Uhlans); behind the left wing were distributed the 7th Hussars and three squadrons each of the 5th and 7th Uhlans—therefore, again, eighteen squadrons. All these units were more or less idle spectators of the action; they played something like the rôle of Mephistopheles' knights in the Imperial Battle ("Faust," Part II.). They contributed absolutely nothing to success; for the occasion to charge, for which they were lying in wait, arose for a minute fraction only. For orderly and despatch duties, as well as for direct reconnaissance on the flanks of the army, were actually needed, perhaps, ten to twelve squadrons. It would have been very easy, therefore, to concentrate on the right a cavalry division of twenty-four squadrons, and on the left a strong brigade of three regiments, and to furnish them with some guns.

If we imagine these horsemen to be equipped with modern firearms, and led in a modern spirit, they might have achieved the most brilliant success. During the battle they could have acted already against the flanks of the hostile army, and vigorously supported the infantry. Much more could have been achieved during the further progress of events. It may be left an open question whether it might not have been possible to delay, on the German left, Pauly's Brigade, marching up from Lempire to the battlefield. But it would have been feasible, without the shadow of a doubt, to cut the French army's line of retreat, and possibly force it to capitulate. For this object it was only necessary to occupy towards evening, when the issue of the battle was no longer doubtful, the crossings over the Canal of St. Quentin, which the French army was obliged to cross. The cavalry on the left would have had only a short ride to Belle Englise, and that on the right about twenty kilometres to Lehaucourt by Homblières and Remaucourt. On the way it could have occupied with a detachment the bridge of Lesdun; but the French Army's main line of retreat could have been effectively barred on the line Belle Englise-Lehaucourt. Nobody, however, thought of employing these horsemen in this fashion—not even a Goeben, the cavalry itself least of all. At that time it altogether failed to have a clear conception of what it really could do and ought to do. There was only a vague idea of cavalry being a kind of battle-reserve, which could be used only in case of dire necessity. Consequently nothing was done at all.

So long as such views prevail, so long as we always want to keep the cavalry directly in hand, with the object of lying in wait for impossible occasions for charging, instead of using its full fighting power on the flanks and rear of the enemy, and placing it thereby advantageously for pursuit, so long will there be no successful pursuit by cavalry. The cavalry divisions must prepare themselves for such, fully conscious that only then can valuable results be achieved. How can it be done? The tactical preparation and brilliant execution of pursuit after the Battle of Nashville, in December, 1864, in the American War of Secession, is an instructive example of that. It will pay us to study the deeds of this kind of cavalry.

In a future European war we must also carefully prepare for supplying the pursuing cavalry, if it is to push forward boldly. It will be a further advantage if we succeed in beating the opposing cavalry during the battle itself. Should that cavalry show the same natural tendency of acting against the flanks and rear of its enemy, the consequence would necessarily be a cavalry duel, which in all probability would be fought with cold steel, since here, as well as in reconnoitring, both cavalries must aim at deciding matters rapidly. But if one side feels too weak, it will probably have recourse to the firearm, so as to at least prevent—if it cannot itself act offensively—the enemy from carrying out his intentions, and thus to bring about an equalization of forces, which gives it perhaps the chance again of resuming the offensive combat with cold steel at a later stage of the fight. In this case must the enemy's resistance be rapidly broken, too. The cavalry must, therefore, always advance early in the day and try to come to close quarters with the hostile cavalry, so as to have its hands free when matters are ripening on the battlefield.

The necessity is shown here again of disposing of a numerous and powerful cavalry, able to do its best in a charge or in an attack dismounted, where it should be capable of employing sufficient rifles in action; such cavalry alone will be in a position to pursue vigorously; and, on the other hand, such cavalry alone will be able to oppose energetic pursuit with some chance of success. And it is this last duty which imposes a further task upon cavalry.

When the battle has been fought; when the army which has fought has lost all moral force for further resistance, and retreat has become unavoidable, it will be the duty of cavalry to guard the flanks of the army against any enveloping pursuit.

Whatever losses it may have suffered in the course of the day, whatever checks it may have experienced, at the moment when retreat begins it must reappear on the battlefield and act offensively, if possible, on the flanks. Nothing will cause greater relief in such moments of moral trepidation than a renewed resolve to attack; nothing will be more apt to nip in the bud any hostile attempts to envelop. But when it is positively impossible to act offensively, the cavalry must make efforts to bar defensively those roads on which the enemy is pursuing parallel to our army. Especially when the pursuing cavalry is trying to use the night for its advance, we must oppose it on all roads and paths with the carbine, and construct hasty barricades, which are best made of wire. In this way a persevering cavalry, aided by cyclists here, too, may save the retreating army heavy loss and demoralization.

It is seen, therefore, that in almost all its spheres of action the importance of cavalry in war has very much increased with the growth of the armies, though its employment somewhat differs from that of former times. But *that* army is sure to derive a great advantage which is firmly resolved to discard antiquated views, and assigns to its properly equipped cavalry those duties which modern arms and military exigencies have imposed on it.

CHAPTER VI

MARCH TECHNICS, SUPPLIES, AND LINES OF COMMUNICATION

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Good reconnoitring and screening being a necessary and preliminary condition for all successful military action, a General could only make the most of the advantage gained thereby if the troops themselves are *fit to operate*—that is to say, if they can endure marching and be continually supplied and provided with ammunition when moving rapidly as well as when being closely concentrated.

Proficiency in marching—suitable equipment being supposed—depends on the physical endurance of the men, on proper training, and on reasonable march technics. Training is quickly attained by what war itself imposes. But as during mobilization and concentration, as well as during the first stages of hostilities, training cannot be so rationally carried out as to allow the weaker men also to acquire gradually their maximum of proficiency, we must be prepared to see very soon a great number of men succumbing to the initial fatigues and disappearing from the ranks. The better the material of men, the smaller will be the percentage in this falling off. The rest of the troops will, within a short time, be so thoroughly trained in marching that afterwards considerable performances can be exacted from them. The German troops, at least, are generally very efficient in marching and rarely fail, even when high demands are made upon them by their leaders. Still, these troops too vary, of course, in their efficiency, according to what they are composed of. Men of the youngest annual contingents march with greater endurance than those of older contingents ; but the efficiency of the former suffers during continual great exertions, which makes them lose their bodily and mental vigour. It is, therefore, always necessary to spare the strength of the troops, and to arrange the marches in such a practical manner that the men are not fatigued more than is necessary even when high demands are made upon them.

These considerations have led march technics to develop into, one might almost say, a special science, in which general staff officers are specially instructed, and in the practical application of which they are practised—at least theoretically. But to my mind, the troops themselves do not sufficiently appreciate the problems of march technics in so far as they refer to *larger* operations. There is everywhere wanting instruction and practical exercise, and yet it is absolutely requisite that the troops should be conversant just with these things. Then only will the arrangements of headquarters be intelligently and successfully carried out.

It is not a question of treating the men hygienically correctly when on the march—every officer understands that—but, above all, of performing the march demanded with the least possible exertion and in the shortest possible time, and of distributing the fatigues among the troops in as equal a measure as possible. But the difficulties inherent in this do not only grow with the length of the column, but also with the mode of quartering them and distributing the troops for the night.

If a regiment * has to cover a distance of twenty-five kilometres, and is resting half-way for one hour in column of route, the exertion of all the men is about the same. But it is quite different with a division, or, indeed, with an army corps. If the column is quartered for the night's rest in depth equal to its length, and is then to advance only a certain distance, to rest again the next night distributed in the same depth, then, of course, all portions can make a halt at the same time during the march as soon as the head of the column has covered half the way. If, again, the start is made from a common billet or bivouac, and if at the end of the march the troops are to close up for the night as before, the troops in rear must move up abreast of the leading unit when that is resting, and in the same way move off again after its rest. In this way we can in the simplest manner distribute the time for marching and rest on all portions in an equal measure. The thing is, however, different when a force concentrated in billets or bivouacs is, at the end of the march, to be distributed for the night in a certain depth, or *vice-versa*. In such a case the various units will have to perform marches of different lengths. The halting-places for the different units must be fixed accordingly, and time and place be calculated in such a way, that when the march is resumed by the different units, the whole column is re-established again, else time would be lost. The thing becomes still more complicated when the various units must move up to the line of advance from places off, and variously distant from, that road, or when, after the march, they have to be distributed in billets unequally distant from that road. Minor differences in the total march performances of individual units can scarcely be avoided in such a case, and need not be shunned. Nor is it absolutely necessary that the lengths of marches before and after halts should be exactly the same for all portions. But great differences in both directions are injurious, and must be avoided by suitable arrangements, especially during long and fatiguing marches. When the columns are very long, it is, therefore, necessary to leave the fixing of places and hours for halts not to the impulse of the moment, but to regulate them exactly beforehand in march orders, else delays and loss of time may be the consequence. On the other hand, we must be prepared to alter the arrangements made, if unexpected events seem to make it expedient.

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* Three battalions of 1,000 each.—TRANSLATOR.

When making short rests and halts for watering or for other reasons, it will generally be done in column of route, or, if necessary, in parallel columns of route, and not by forming up in closed formations, otherwise time is lost or the uniformity of rest disturbed. Even during these short halts care must be taken that the forward movement of the whole is not delayed by the halt of the various portions. While one body is halting, the next one must pass it and halt on its own part when the first is starting again, and so on throughout the whole column at the same or different places.

During long rests, and particularly when the troops are to cook or to feed from the field kitchens, the water-supply will settle matters. It will, as a rule, be advisable to form up in groups in the neighbourhood of localities or river courses. The existing water can then be made the most of, and crowding in localities will be avoided, with all the friction connected with it. If the troops are to be fed from the field kitchens, these must follow immediately behind the units to which they belong, and therefore be on the march with the first line of transport, as it would otherwise take far too long to bring them up from the rear when the columns are deep.

The consideration of all these points calls for the orders to be deliberately drawn up, and, above all, demands practice, so that a suitable procedure when carrying out difficult arrangements for a march becomes a second nature also to subordinate commanders. The whole army must be familiar with the system by which all are to act, otherwise rapid advance, while sparing the troops at the same time as much as possible, can never be attained. But to attain this is of importance; for to be ahead of the enemy in this branch means a superiority that must not be underrated.

Owing to the many roads sometimes required, but not available in the operations of large armies, we may want to shorten the march columns with a view to accelerating concentration on the one hand, and on the other of facilitating supplying the troops from the rear. To attain these objects double columns of route are used. This makes the march itself more difficult, especially on dusty and bad roads; but it is only feasible if the roads permit the march to be continued on such a broad front during the whole time it lasts, or if narrow portions of the road can be turned. It is therefore advisable, if such difficulties are anticipated, to bring up some engineers who, covered by cavalry and cyclists, precede the column with the object of widening the road where necessary, of marking out a military road, or of making fords passable. We must, at any rate, avoid forming again the single column of route during the march.

Similar reasons to those necessitating the shortening of columns of route may sometimes induce us to march across country. When turning defiles, when unfolding for action, and on other occasions we must often leave the regular roads altogether. The troops must, therefore, be practised also in marching across country, so as to get rapidly over any difficulties that may arise.

The idea of performing long marches across country seems somewhat monstrous in our eyes to-day. We are so spoiled in making our operations dependent on roads that we can scarcely realize any other mode of operating. And yet it is quite natural, requiring nothing that has not been proved possible by the experience of wars of former times. Frederic the Great's army often marched for miles across country. I need only mention Schwerin's advance to the Battle of Prague as an example of this. Engineer parties were often attached to the heads of columns to remove or bridge likely obstacles. We see these measures adopted already in the First Silesian War. Artillery and transport, if possible, used roads. We have not the least cause for assuming that what was possible then would be impossible to-day. The opposite is true. The engineers are to-day far more efficient than formerly, and the country is generally more cultivated and richer in roads. Even when we are marching across country we can now and then use roads, though not first-class roads, of course. There is no reason, either, why the artillery and transport of, say, two army corps should not march to-day, as then, on the road, while the infantry is marching on both sides of it, advanced-guards going ahead marking out and making passable the way for the infantry. This procedure may sometimes be very much more practical than marching two army corps behind each other by one road, or shortening the march columns. One thing is, of course, necessary, and that is, that when marching in this way, there must be one uniform command. If there is no metalled road at all, the artillery must move across country too, and, in case of need, the necessary transport as well, if the object cannot be reached by a roundabout way. The marches must then be made shorter. Engineers will, in such cases, always precede the column. It will be as well to make frequent changes in the units marching at the head of the column, because they have the hardest task. If the track across country is once firmly trodden down, there are, as a rule, no longer any special difficulties. Of course, we do not march like this at ordinary times; but when large armies are closely concentrated, marching in this way may greatly enhance their power of operating. Naturally, it is always desirable to have the country to be traversed reconnoitred beforehand.

Like marches across country, so will night marches become necessary in a future war more frequently than hitherto. They will be used to escape, for instance, reconnaissance by balloons, to avoid losses by artillery fire, or to approach the enemy's position unobserved. If marches have to be executed across country in the dark, it is absolutely necessary to reconnoitre the country minutely beforehand, and to fix landmarks which cannot be missed even in darkness. Such marches cannot be arranged off-hand; they must be carefully prepared. The troops, too, must be practised in them, and acquire a certain amount of skill in marching by night if they wish to avoid disorder at decisive moments. At night we should not march in double column on roads, because difficulties increase in darkness, and controlling the column is easier if one side of the road is left free. But when marching across country it will be advisable sometimes to execute the movement in shorter and broader columns, so as to keep the troops better in hand.

The problems of march technics are therefore great in number, of various kinds, and not always easy to solve. The difficulties in arranging the marches themselves properly become greater by the attention it is necessary to pay to the supplies the troops continually require. Some distant marches may certainly be executed in critical moments with any system of supply if iron rations are available, or if we are marching with not too large a force in a rich country able to furnish the necessary provisions. But when we have permanently to rely on the supplies carried with us, and must spare the iron rations, the average length of the marches depends directly on the possibility of supplying the troops constantly from the rear. Anything going beyond this average measure in the forward movement must again be compensated for by shorter marches or days of rest. The arrangements for the marches themselves are often influenced by questions of supply. Distinct laws prevail with reference to this.

To be able to judge of the operative power of modern armies, we must first form a clear idea of what is possible in the way of provisioning the troops; and, during the practical operations themselves we must always keep in view the effect of the supply service on the movements of the troops, firstly, so as not to arrange for the impossible, and, secondly, so as to actually perform the possible.

And, therefore, the method on which the service of supply must be based is thoroughly studied and worked out by the General Staff of the German army. General Staff and administrative officers are specially trained in this service. There is hardly any new point in this branch that has not been carefully considered. But the troops, and often superior commanders even, do not sufficiently take account of the difficulties to be overcome on active service, and of the entirely altered conditions which have arisen in this respect since the last great German war.* We, in many quarters, still seem to think that things will come off in about the same way as they did in 1870-71, with the firm conviction that the General Staff and the administrative services will hit upon the right procedure to save the troops all difficulties.

Our training, too, contributes to this notion being upheld. In manœuvres the supplies are never treated as they would be in war. Neither troops nor commanders can learn here anything for war; this mode of supplying the troops often leads to operations which, on active service, could not be carried out for reasons of supplies alone. On the other hand, in theoretical exercises, operative questions and transport are treated, in most cases, apart from each other. At war games there is no time, as a rule, for discussing thoroughly the mechanism of supplies, and when questions of supplies are worked out, the operations are assumed as given. The relative dependency of both branches—the restrictions which supplies impose upon the operations, and the varying demands made upon supplies from the point of view of operations—are in this way never clearly elucidated nor brought to the knowledge of commanders. But all depends on whether *the commanders of troops* themselves are perfectly clear on these points. Only when they are so may we rely, to some extent, on seeing the arrangements for operations and supplies working harmoniously together on active service, and to aid each other in a practical manner, thus ensuring the best possible performance of the whole.

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* Even such a thoughtful soldier as General Freiherr von Falkenhausen underrates, I think, the difficulties resulting from having to supply the enormous masses of which the armies are composed. The proof, it seems to me, is needed still, that the operations of which he gives us an example in his new and instructive book, "Flankenbewegung und Massenheer," are altogether feasible as regards march technics. I hardly think it possible to carry out the operations independent of the lines of communications in the way he does it.

At the time of the Napoleonic wars the system of supply was comparatively very simple. The troops carried a few days' provisions with themselves, partly as iron rations, partly on vehicles. For the rest they lived on the country, though exceptionally by subsistence in billets and by their own requisitions; but, as a rule, by requisitioning through the civil authorities of the enemy's country. The armies were thus greatly independent of their lines of communication, but, on the other hand, were often very badly provided for, especially when closely concentrated, and occasionally perished from want of supplies. Napoleon's armies, with this system, dwindled away in an incredibly short time, and the number of men he wasted was something enormous.* In 1870-71 we used a mixed system, as we have mentioned already. We generally lived on the country. During operations the supplies were furnished in billets by the inhabitants or procured by requisitioning; when the troops stayed for some time, they were supplied from magazines formed by contractors or by requisitions. The provisions carried in the columns were only used during emergencies. To-day it would be impossible to supply the armies by either method.

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* Jean Morran, "Le Soldat Impérial." Paris, 1904.

During concentration, during long pauses in the operations, in defensive positions or at sieges, the old methods can certainly be used even to-day. Magazines are then established as closely as possible behind the troops, and filled by requisitioning, by contractors or by purchase in the country itself. A regular vehicular traffic establishes connection between the depots and the troops. In minor theatres of war, on the other hand, where smaller groups of armies oppose each other in a rich country, we can employ the same method to-day as in 1870-71. When advancing on a broad front through districts hitherto untouched, even subsistence in billets may sometimes be utilized. But when the enormous modern armies face each other during active operations, we are entirely dependent to-day on supplies from magazines; and we would paralyze our own mobility and offensive power should we make use of obsolete methods of supply by provisioning the armies chiefly with what we find in the country.

When millions of men concentrate at the frontier, the area of concentration will be completely drained. The provisions existing there cannot meet their wants for any time. The men must be supplied from magazines filled from other parts of the country. After concentration, two possibilities then present themselves. Either we advance and invade the enemy's country after victory, or we retire beaten in our own country.

In the former case we enter first an area which is completely exhausted; in our further progress we must traverse districts previously passed through and impoverished by the hostile army. In 1870-71 it was different. The French army was then chiefly supplied from magazines, and did not drain the country in the way it will be done in future. The armies then were, moreover, small in comparison with those of to-day; their wants were infinitely less. The experiences of those days must, therefore, on no account be looked upon as a guide for the future. When we are on the offensive we must rather reckon with districts in which there is no doubt the wants of the army cannot be met. If we think of Russia, this fact becomes particularly obvious. But even should the theatre of war contain, on the whole, the supplies necessary for the armies, we could never be sure of the troops finding them just in that part of the country through which they were passing at the moment. All roads are covered to-day with columns of the army; the area which it is possible to assign to each column on either side of the road is comparatively narrow. The chance of collecting supplies from afar is therefore entirely out of the question. The time, too, for collecting at a distance would as a rule be wanting. Where the line of advance leads through extensive forests, over mountains, or particularly poor districts, we shall scarcely find any supplies at all. It may often be impossible for strategical reasons to billet the troops in depth. The chance of using the provisions of the country is then still further reduced; in short, the idea of intending to live on the country with a modern army engaged in active operations is altogether beyond discussion.

If, on the other hand, we retire in our own country, we will not always find the necessary supplies on the spot either, nor will we always be able to make use of them if they exist. At first we are in the impoverished area of concentration. Retiring further we may be obliged to traverse poor and thinly populated districts unable to cover the wants. We retire, moreover, pressed by the enemy, and it will scarcely ever be likely that we could collect from afar provisions for the daily wants. Still, when we are retreating in our own country, the question of supplies is comparatively more favourable, because we can count upon the population supporting us everywhere. We can also by timely arrangements make the civil authorities get supplies ready. But matters are far worse when, after a victorious advance, we are obliged to retire through the *enemy's country*. We then move through a district which first the enemy's, and then our own army, had traversed once before. In such a country we are sure to find nothing, and are absolutely and entirely dependent on the supplies we carry with us.

It cannot be denied that, where the theatre of war provides little or nothing, conditions like these will occur in a future war; and we can be quite as sure that even in a country containing provisions, still we can never know for certain, under the conditions of modern war, whether the troops will find them in sufficient quantities within the area they are billeted in, or within its close proximity. We therefore constantly run the risk, if we count upon finding these provisions, of getting into districts which are unable to supply the wants of the troops. We may then accommodate ourselves for a day or two from the second line transport waggons or do with the iron rations; but to refill these waggons from the supply columns will be a difficult thing if that is not *systematically arranged beforehand.* This cannot be improvised from one day to the other; all the marches must be arranged with a view to getting the provisions spent replaced in time from the rear. The supply columns would not, as a rule, be able to meet unexpected demands. We would never be able to count upon relief arriving in time if we order it up at the moment only the want is being felt. Even in 1870-71 the supply columns and parks could meet sudden demands during active operations only when they followed close in rear of the troops, and if these were not marching in columns of too great a depth. Under modern conditions, where the greater length of the columns renders it considerably more difficult than formerly to bring up rapidly the supply columns, we can still less count upon their arrival if we adopt the same system.

There is therefore no other alternative left when operating with large masses than to rely from the outset *entirely on supplying the troops from magazines,* and to arrange everything from this point of view.

We are accustomed to look upon this mode of supplying troops as a disagreeable hindrance. This is a view we have imbibed in our youth, and also during our studies of military history. Getting rid of the bread-waggons of Frederic's time was felt by Clausewitz as a perfect deliverance. Freedom of movement seemed to him assured by living on the country. He thought the system of the civil authorities furnishing the provisions to be the simplest and most natural thing in the world, though he was not unaware of the grave defects that might arise from this system of supply during large concentrations of troops, during retreats in an enemy's country, and during extensive operations lasting some time. A systematic return to supplies from magazines he dismissed as impossible, yet in spite of this he admitted that situations might arise where armies would be obliged to live altogether only from magazines.

We must entirely break with these views of a past age. Clausewitz could not have anticipated that the armies would grow in a manner that makes it impossible for them to live on the country, and that, on the other hand, new means of transport, in the shape of railways and motors, would appear. To-day the conditions are reversed. To-day it is just the inauguration of supply depots which insures to us freedom of movement. They make us independent of the theatre of war and of accidental circumstances; they allow us to operate at our own will and to any extent; they render the offensive feasible and promote it, and thus make it possible to counterbalance numerical superiority to a certain degree. The more practical and logical this mode of supplying the troops is developed and carried out in the movement of masses, the greater will be the operative superiority over any enemy whose system of supply is governed by more or less obsolete ideas.

Of course, we don't want to say with this that the supplies in the theatre of war should be left entirely untouched. On the contrary, they must be thoroughly utilized. They must, in the first instance, serve to help supplying from depots, and furnish particularly fresh meat, bread, and vegetables. They must further be systematically collected to fill the depots. The localities in which the troops are billeted must naturally deliver up to them any stores that may be still available ; the amount found will save the stores in the depots. The villages not occupied, and behind and on both flanks of the army, must be drawn upon to fill the depots by purchasing or requisitioning their stores. The troops themselves only are to be completely independent of the country for their daily wants, nor must they weaken themselves by detaching requisitioning parties.

Yet even this method must not be raised to an inflexible law ; we should only act in this sense *as a matter of principle generally.* Exceptions, of course, will occur. There will always be some enterprises for which the supplies cannot be prepared beforehand. We must then, of course, fall back on the resources the country itself affords, or must otherwise act to suit the occasion, or know how to set to work. There are no prescriptions for every case. In no case must the vigour of an enterprise suffer merely because the supplies were not secured by the commissariat beforehand. That would mean casting ourselves into chains of our own make. Just as little as Frederic the Great took account of magazines in urgent cases, and lived entirely on the country for some time, achieving just thereby the most brilliant successes—we need only remember his march from Rossbach to Leuthen—so must we also learn to act.

As a rule, supplies from depots, accommodation by the country, and thus perfect freedom of action—this is the principle of supply in modern war.

Clausewitz, when discussing the possibility of supply from depots alone, raises the question: "Will the war rule the system of supply, or the system of supply rule the war?" The question is of importance even now, and so is the answer Clausewitz gives: "At first," he says, "the system of supply will rule the war in so far as the other conditions on which the war depends will permit; but when these begin to offer too much resistance, war will react on the system of supply, and in that case rule the same."*

This holds good for modern conditions too. The necessity of returning to the system of supply from depots alone in all great operations of masses will undoubtedly influence the kind of warfare. It would be useless to deceive ourselves on this point. But there will be, on the other hand, always conditions where purely military exigencies will oblige us to make use of other modes of supply for carrying out military plans.

For all that, there can be no doubt that subsistence from depots is imperative as a matter of principle in operations with masses. It is desirable to have this decisive point more clearly and more definitely expressed in the German regulations than is actually the case; above all, in the "Field Service Regulations." The troops and their commanders form their ideas by them; we must reckon with this on active service. But these regulations are little calculated to produce the idea of the system of supply by depots being *a necessity as a matter of principle* during the active operations of large masses. It is rather stated there expressly that this mode of supply *may* only, under certain conditions, become necessary—namely, in poor districts and when the troops are closely concentrated (F.S.R., 450).* We must further conclude, from the rules laid down in these regulations, that the supply columns and parks as well as the field depots are to serve only as a reserve of provisions, and are not meant to meet the current daily expenses (F.S.R., 459, 460).*

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* Clausewitz, "On War," book v., chapter xiv.

If troops begin operations with ideas of this sort, they will not find it easy to accommodate themselves to conditions as they will actually find them.

Even the theoretical treatment of questions of supply often leads to erroneous ideas. I like to mention here above all the book written by General von François,† a book purely professional and meritorious by itself, which is meant to show the commanders of troops the manner in which the provisions of the country may be made to supply the wants of the troops in a suitable manner. I consider the mode recommended there for making the most of the country as infeasible in a war of *masses*, quite apart from the fact that the description starts from a presumption which is very exceptional. For, the author assumes that we can form an idea of the provisions available in a certain district by the statistical records everywhere existing, and that from them we could calculate whether they would be large enough to provide for the army. If this were so, we could live on the country. This view is obviously correct only if we enter a country perfectly untouched, which not only was not a theatre of war as yet, but whose export of provisions has not yet been indirectly affected by the war. I hardly believe that we could ever reckon with such conditions in war. This statistical basis will rather prove deceptive always, and the system of subsistence, resting on such foundation, must fail the moment the conditions, not only in the theatre of war, but also of the troops operating in it, are different from those depicted in the book mentioned. The real difficulties of supplying the masses, it seems to me, are not touched at all by the assumptions of the author.

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* German Field Service Regulations, 1908. These are translated into English by the Imperial General Staff, and can be obtained from any bookseller for one shilling.—TRANSLATOR.

† v. François, "Feldverpflegungsdienst bei den höheren Kommandobehörden."

We cannot do otherwise, in a modern war of masses, than to reckon with the fact that the army must permanently subsist on the provisions accompanying it, and that these provisions, whether collected in the theatre of war itself or brought up from home, must constantly and altogether systematically be pushed after the troops. It is *this* mode of supply and the systematic procedure consequent thereon of bringing up the provisions from the base which we must study, if we wish to form an idea on the mobility for operations of the modern armies of masses. But it seems unnecessary, nor is it intended in this book, to describe in detail *the whole* of the supply service. I rather wish to enter into this subject in so far only as the command of troops and their capability of operating are directly affected by it.

The manner in which the armies are subsisted reacts of course forcibly on *the whole* supply service; but the *commanders of the troops* themselves are only *directly* concerned with the last links of the complete chain joining the field army with the home country. The general commanding the troops only deals with these last links when arranging for supplies during his operations. It is the business of the authorities at home and on the lines of communication to furnish him with the necessary provisions and means of transport. The co-operation of commands with these authorities is, however, prepared in peace time so systematically that we can without any doubt rely on a proper working of this service; there is therefore no need for entering here into *details* of these matters. I will deal with them only in a general way, and as far as seems necessary to understand the system.

To each army corps is assigned a Home Base in the district in which it is stationed during peace, and to each army is assigned a Collecting Depot in the district of one of the army corps that forms part of the army. In the former all goods are collected which are meant for the army corps, and in the latter all those meant for the army; thence they are sent on. Where the railways which are chiefly concerned with this traffic cross the frontier a Transfer Station, but on this side of the frontier, is established; at that station peace management ends and war management begins, under the supervision of the Military Directors of Railways. Here also begins the Area of Lines of Communication, which extends to the actual Area of Operations. The railhead in the enemy's country forms the Base. Within the area under peace management all supplies consigned to the army are transported by military supply or special trains, in accordance with the ordinary peace time-table ; peace traffic is restricted in case of need. From the Collecting Depots trains are despatched in numbers suiting the traffic on the railway lines in the Area of Lines of Communication. From the Base to the army and its various columns communication is kept up by field railways, motors, or supply columns. The control of the railways is entirely in the hands of the railway authorities, who, as much as possible, comply with the demands of commanders and military authorities. The Lines of Communication authorities are the medium for communication with the home authorities, on the one hand, and with the operating armies on the other, and receive their instructions from General and Army Headquarters. They have to do all they can for keeping the army supplied, especially with provisions and ammunition, in such a way as to preserve its efficiency for operations ; while at the same time they have to evacuate sick, wounded, prisoners and spoils of war, so as to relieve the troops of their care and duties connected with it.

Every means must be employed to meet these manifold duties. In addition to the railways, we must use the roads for motor transport ; where we find navigable waterways, we must utilize them for transporting material in bulk (provisions, ammunition, and other military stores), the arrival of which at its place of destination is not limited by time. Water transport is particularly suitable for taking back the sick. Waterways are, however, lines of communication that cannot be permanently relied upon; they depend too much on the season and the weather. In winter they are frozen; floods and low water limit their efficiency. Where special structures exist, such as locks, water reservoirs, tunnels, and bridges conducting canals over rivers, they may be damaged or destroyed, making all traffic doubtful. Waterways are nevertheless sometimes a valuable substitute to relieve the railways.

In the actual area of operations all orders, including those for supply, are issued by generals in command of troops, who keep in constant touch with the authorities on the lines of communication. The real difficulties to be overcome are felt only when active operations begin. They will not always be the same here either. In a rich country traversed by numerous arteries of communication these difficulties will be smaller than in a poor theatre of war, with few such roads. Troops operating in their own country will find things less difficult than in an enemy's country. But, apart from all such special circumstances, the size of modern armies itself presents difficulties not easily mastered. Commanders must have a clear perception of these difficulties, and have thoroughly digested them mentally to be able to act practically. The theoretical knowledge of general staff and administrative officers alone does not suffice at all to master these matters. They must be met by the commanders and the troops themselves in an intelligent manner. The whole procedure must become routine if it is to work smoothly. It becomes therefore a question of condensing the principles by which we have to act into simple rules and broad outlines, according to which the daily arrangements must be made without necessitating every time minute deliberations on the method to be employed. Special circumstances naturally demand special considerations. But the daily procedure generally must be regulated from such simple and definite points of view that the troops themselves get easily accustomed to it. It would be most practical if these points for supplying the troops from the base were laid down in the Field Service Regulations, so as to make them common property of the army.

With the modern armies of masses it will only, under favourable circumstances, be possible to march in small columns, say divisions. Generally one road must be apportioned to one army corps, and as it is more difficult to supply an army corps on the march than a division, it seems more practical to deal here with an army corps, and not with the more favourable case of a division.

The problem to be solved is therefore first of all to supply from depots only an army corps during its advance, without necessitating its march being interrupted. We can further assume the army corps to occupy twenty-five kilometres of road, and to perform a daily average march of twenty to twenty-two kilometres. The troops are followed by their supply, forage, and baggage-waggons, which in Germany are called heavy baggage. The next links are the supply columns. It would be most practical to organize them in units of supply in such a manner that each single column contains the total daily supply of the army corps, while each column again should be divided into divisional units,* and a separate column organized to carry the supplies for the supply column itself. The supply columns are the link between the regimental supply waggons, which issue the provisions to the troops direct, and the depots in rear, these being pushed forward behind the army by the lines of communication authorities, and being themselves supplied from the railways by depot columns.

In this or similar ways communication is necessarily kept up during a forward movement the moment railheads cannot directly follow the troops, and it will be always the case where we find few railways, or where in an enemy's country the railways have been destroyed. This transport will be carried out on the whole with draught animals. On good roads we shall, of course, be able to-day to substitute mechanical transport; but as we shall not find good roads in every theatre of war or in every country, it is best if we deal first of all with the more difficult case of having no other means but teams of animals. The efficiency of these draught-animal columns will therefore control the army's capability of operating.

All depends here on the marching power of the supply parks, columns, and waggons with their normal loads. We cannot rate this power much higher than the marching power of the troops themselves. A daily march of thirty to forty kilometres is generally the most we can exact from these waggon columns if we wish to see them always efficient. This is expecting a great deal already from such formations, but it is not all ; more is required from them in comparison with the troops, because additional fatigues are thrown on the men in the supply columns by the constant loading and unloading of the supplies, by frequent night marches, and by irregular and bad quarters. Irregular feeding and night marches, together with bad or insufficient attendance, with no rest days, will be particularly injurious to the animals. It cannot be denied that in some cases more can, and must, be exacted, as, for example, in the last great wars waged by Germany, where the supply columns at certain periods did a great deal more. But I do not think that we can keep the whole apparatus working if we exact too much continually. We have to remember that, in a future war, with *constant* supply from depots, the total performances will be very much greater than formerly, and that it will be very difficult to make good the waste in animals considering the great demands for them which scarcely can be met even on mobilization.

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* A German army corps has two divisions.—TRANSLATOR.

If we take matters as here assumed, and if the second line regimental transport follows the troops at a few kilometres' distance, the following will be the procedure which we must not depart from, as a matter of principle, unless we are prepared to suffer punishment.

The supply column, the rations of which are to be issued, must be moved up into the area where the troops are spending the night ; the regimental supply waggons join the supply columns at the refilling point, after having previously handed over to the troops their contents—*i.e.*, a day's rations. The regimental waggons, after having been refilled from the supply column, must remain near the refilling point for the night, or for rest, and thence take their place in the column of route next day. In order to reduce the march performance of these vehicles, it is necessary for the troops to spend the night not in the same depth as they were marching in, but to close up to about half that depth, and to assign to each division a refilling point. It is further advisable to keep all the supply sections *in front* of the baggage sections during the march itself, so that they may reach their destination sooner. The baggage we can miss in case of need, but not the provisions. Even when arranging matters in this way the daily march performance of the supply sections will be considerably more than twenty-two kilometres.

If under these conditions the provisions are to reach the troops in time, they themselves must not start at arbitrary hours. The heads of the columns must start correspondingly early if the troops are to get their supplies as yet during daylight or before their night's rest. The time is regulated by the length of the column and the length of the day's march, between both of which there is a certain reciprocal effect. The longer the column, the earlier we must start or the shorter must be the day's march, if the system is to work properly. Should we therefore wish, from strategic reasons, as is often the case, to start at a later hour than that calculated, the march must either be shortened, or we must abandon the hope of seeing the regimental supply waggons arriving in time.

The calculation can be easily made. If a column of route twenty-five kilometres long, having rested within an area ten kilometres deep, is to cover a march of twenty kilometres, and to start at 6 a.m., it will, with all its troops, have reached its new quarters, likewise ten kilometres deep, by 2.45 p.m., going at the rate of one kilometre in fifteen minutes. If the regimental supply waggons follow the column at three kilometres' distance, they will be with their units by 6 p.m. But if the troops start at as late as 9 a.m., the vehicles can have joined their units only by 9 p.m. Should the march, however, be shortened, say, to twelve kilometres, the supply waggons can have reached their units as early as 7 p.m., even if the head of the column had not started before 9 a.m. But if the column is, for instance, twenty-nine kilometres long, the supply waggons will arrive in both cases one hour later, and correspondingly sooner if an earlier start is made.

Should travelling field kitchens be available, we can move somewhat more rapidly, provided these remain with their units, which is, at any rate, the most practical. In that case the troops can either feed during the march or directly after it, the empty field kitchens being refilled from the supply waggons afterwards.

If the military situation permits the second line regimental transport of the leading division to be placed between the two march columns of the divisions, the conditions are much more favourable for the leading division than it would be otherwise, the division in rear, of course, in that case reaching its quarters at an hour so much later, as it will take the length of the interpolated column of supply vehicles to cover.

As regards now the movements of the trains—that is to say, of the actual supply columns—a thorough investigation of the matter shows that the section containing the rations for the next day must be pushed forward far enough to be not more than a day's march behind the head of the army corps. Assuming this to be so, it must perform on the day of issue itself almost a two days' march to reach the place of issue or refilling point, and must therefore start at such an hour that it can follow, if possible, immediately behind the second line regimental transport of the army corps marching in front; only in that case will it be in time at the place of issue. At the refilling point itself, where this section has also to stay overnight, the provisions must be unloaded for the regimental supply vehicles to receive them easily when they arrive, the supply column itself clearing the place and moving into bivouac.

It is further a law that it is possible only to subsist the troops continually from the supply column if *twice as many sections of it with one day's supply are available as the head of the army corps is days' marches distant from the depot.* If, for instance, four supply echelons are available, the army corps must not move further away from the depot than two days' marches, so as to be constantly supplied from it. If the corps continues marching, it could at the most be supplied up to the sixth day of march* only. But the echelon carrying the food for that day has to perform marches of so great a length that its arrival in time seems doubtful. Nothing is therefore left except either to abandon subsistence from depots, and rely more or less on chance, or to push the depots after the troops. Shortening the marches of the troops would only temporarily increase a little the march performances as a whole.

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* *Vide* Appendix I.

If the depot is to push after the troops, it must be done here systematically too. It must be advanced by leaps, as it were, in such a way as to be never further behind the head of the army corps than half the number of days' marches as there are numbers of day sections in the supply column.*

The night must be used to push the depot forward, and it must be done by a long march, to avoid the necessity of moving it forward every day. If it is pushed forward every other day, which is necessary when there are only four supply echelons, a night march of twice the ordinary length is needed. If the depot was transferred every third day a march three times the ordinary length would be required, or sixty-six kilometres—a distance therefore that could not be covered in one night.

The troops will have to find fresh meat as a rule in the country itself. They will often have to go without it in these modern times and their armies of masses. To drive cattle behind the supply columns, and to bring up fresh meat to the troops causes considerable difficulty. Just as troublesome is it to supply troops with bread. If the field bakeries can be pushed forward at the same rate as the depots, and if the supply columns can carry the bread right up to the regimental waggons it is a comparatively simple matter. The empty columns in that case receive the bread at the depot at the same time as the other victuals. But if the bakeries have to remain longer in a place than the depots, or should it be impossible to billet them together with the depots, or somewhere on the road between the depot and the troops, separate bread columns must be used, formed either from vehicles of the lines of communication or supply parks. These bring the flour from railheads to the bakeries, exchange it there for bread, and either carry it to the advanced depot, or direct to the regimental supply waggons, or to the supply columns of the army corps. The same laws apply to the traffic of these bread columns as to the traffic of the supply columns of the corps; the distance of railheads from bakeries and advanced depots determines the number and length of marches of these bread columns. It is absolutely necessary that the field bakeries should always be pushed forward, as far as possible, so as to stay as long as possible at the same place for regular work. They should, further, be established on the main line of advance, or close to it, to avoid causing the vehicles any detours when bringing up flour and fetching bread. Lastly, everything should be arranged strictly systematically to ensure the method working properly.

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* *Vide* Appendix II.

To carry out the work in this way, it is, above all, requisite for command to be uniform, and organization to be practical. The columns connecting the fighting troops with the advanced depots must be organized from the outset in day units. A division of the transport in columns and parks is no longer practical, as it would merely create another intermediate organ in a traffic which must work like a machine, so to say, in ordinary times, and is based on the principle of pushing the depots regularly forward. A division of the transport in columns and parks was expedient so long as they were simply looked upon as a reserve for occasional use in emergencies. But when these columns and parks are meant to communicate permanently between the regimental waggons and depots, they must be placed under one uniform command to carry out their work properly. The field bakeries, however, must get their orders direct from army corps headquarters. That authority alone is in a position to regulate the movements of the bakeries. But the lines of communication authorities must of course get early information of any intended movement of the bakeries, so as to enable them to regulate the arrivals of flour and the departures of bread, and to see that sufficient waggons are available when the distance increases. A certain regularity in pushing the bakeries forward will facilitate matters here too.

For the other columns and trains of the army corps, such as ammunition columns, ambulances, etc., which follow the troops at some distance, a division into two echelons, or lines of transport, is evidently advantageous. The wants immediately arising will be covered by the first echelon, which follows the troops at as small a distance as possible. The second echelon's duty is to replace what the first echelon has spent, and to keep in touch with the line of communication authorities, who see to all material being replaced, and the ammunition depots and field hospitals being pushed after the troops.

The subsistence of these portions of the corps must be regulated independent of the fighting troops, and is much easier effected than with the latter, because all these units are billeted, more or less, in close proximity, or even in rear of the depot, so that they can replenish their provisions from it when passing near or through it on the march. They can, moreover, carry on their own vehicles a certain amount of provisions.

But these are not all the difficulties caused by permanent subsistence from depots. There are as many difficulties on the lines of communication as there are in the area of operations itself. To bring up supplies and refill the depots, more means of transport are again needed between railhead and depot, and to an amount and in proportion similar to that required for supplying the troops from the advanced depot. The demand for transport grows with the distance. For all that, communication will be easier here, than between depots and troops, because this latter traffic is influenced by the movements of the troops; and these, again, are regulated by strategic and tactical considerations, which, therefore, makes the traffic subject to many alterations and irregularities. These troubles do not generally arise on the lines of communication. Times and distances are, as a rule, more settled here, allowing, therefore, greater average daily march performances to be exacted from the lines of communication columns than from the transport of the troops. It is best to organize the lines of communication columns also in day units, that is to say, in detachments carrying all the supplies of one day for a whole army corps, including everybody ; but to keep up regular traffic we need not here twice as many units as there are days' marches between railhead and depot ; their number can be smaller on account of the greater march performances of these formations.

It is plain from all this that it is rather difficult to keep an army corps constantly supplied from the rear when marching by one road ; but the difficulty is greatly enhanced when we are obliged to march two army corps by the same road, which may become necessary when large numbers of troops are concentrated.

Field-Marshal Moltke has repeatedly dealt with this case. He never held the opinion that one road must always be assigned to each army corps ; at the beginning of the 1870–71 campaign he preferred rather marching in great depth, so as to unite on the battlefield as many forces as possible. In a memorial addressed to the departmental chiefs of the great General Staff, on May 6, 1870,* he enlarges upon the idea of advancing from the frontier to the Moselle, with two armies in three columns and two echelons a day's march broad and deep, " so that the junction of 150,000 men can be effected by one march towards the centre, or even towards one wing of the front line." The columns and parks were to follow close in rear of their own corps. The corps in column of route was assumed to occupy 19 kilometres of road (two and a half geographical miles).

The attempt of carrying out such a compact operation was practically made in the advance on Sedan. The Third Army and the Maas Army marched in two echelons, and when, afterwards, they were to march off to the right on Sedan, not two, but even more corps were put on the same road by the Third Army without any regard to the depths of the columns. It became then, indeed, clear that the thing is not so simple as it was apparently thought to be. It was not at all sufficient to fix the times for the heads of the corps to start as was actually done, and to make the columns and parks, in compliance with Moltke's directions, immediately follow behind the corps to which they belonged, leaving a perfectly free hand to the commanding generals to arrange for the rest. The times fixed for the start being all wrong with regard to the length of the columns, and no special arrangements having been made at all for the columns and parks, the whole procedure caused the gravest inconveniences. A frightful confusion arose, troops and vehicles being mixed together in a manner that most seriously affected the efficiency for action of at least the Third Army. If the French had attacked the heads of the Third Army on August 28 or early on August 29, which might easily have happened, that army would not have been in a position to deploy all its forces for battle; but in case of retreat, a catastrophe would have been inevitable owing to the complete block on all the roads.* The whole movement developed in such a way as to deprive the troops even of the use of the provisions of the supply columns accompanying them, forcing them to subsist direct on the country, with all the worst evils consequent thereon, and possible only in a country as rich as France. In a poorer theatre of war the movement would in all probability have ceased altogether.

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* Moltke's "Militärische Korrespondenz." Dritter Teil, No. 20.

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* *Vide* Grosser Generalstab, Kriegsgeschichtliche Abt. I., "Studien zur Kriegsgeschichte und Taktik," i. 2.

After experiences like these, marching in greater depth than one army corps by one road with subsistence from depots, seems to be altogether impossible. Yet it is not so.

If the length of a column is greater than the march to be covered, the latter cannot, of course, be performed by the whole column at the same time, but must be executed by several parts of the column in succession. The column must, therefore, not be longer than *that* portion of the road, which can be altogether covered by one day's march. Assuming we march fifteen hours in one day, and that the rate is 4 kilometres per hour, the column marching by one road must then not exceed a length of 60 kilometres. If this column is to be subsisted from the rear, without excessive march performances being demanded from the supply vehicles, the column must not advance more than about 20 kilometres, closing up for the night on itself to about 20 kilometres. With arrangements like these all supply vehicles must certainly use the night for marching, but they can reach the troops before they have resumed the march next day. Should field kitchens be available, the movement would be very much facilitated. In that case the troops can feed directly after completing the march, and the kitchens be refilled during the night from the incoming supply waggons. But if no field kitchens are available, as they will not be with German mounted troops, the leading units of the column, at least, must carry on them the next day's rations received during the night, and cook them directly after halting at the end of the next day's march. The traffic of the corps supply columns between the regimental supply waggons and the depot, as well as the pushing forward of the latter, are regulated by the same principles as the march of one army corps. It is obvious that the lines of communication authorities will not form regular depots when the march forward is continuous, but will consider it more practical to keep the supplies on the move, pushing them forward daily, and not in stages at intervals; this will save time and labour. They will merely establish places of issue, up to which the provisions are pushed by the lines of communication columns, whence they are transferred to the supply columns of the army corps.

A column 60 kilometres long, being thus the utmost limit of the number of troops which can be marched by one road and subsisted from depots, it represents the depth of two army corps (assuming each to be 25 kilometres long) plus 10 kilometres for second line regimental transport. That transport can move up to the troops during night. The ammunition columns and trains must march behind the troops of both corps, and behind the necessary supply echelons; they must move by night, close up behind the troops and on themselves, and allow the lines of communication supply columns representing the movable depot of the fighting troops to pass them.

For the rest, the order of march of the two corps may in many ways differ, according to whether more stress is laid on greater preparedness to strike, or on a more convenient mode of subsisting and supplying the troops.* In the former case we would bring up the ammunition columns and field ambulances, and march them directly behind each corps, placing instead the regimental baggage and supply sections further in rear of the march columns; in the second case we would march the supply vehicles first, and the ammunition columns and ambulances further in rear of the troops.

In this last case there are again two alternatives. Either the supply and baggage sections of both army corps follow unitedly all the fighting troops, and behind them the supply echelons, or the supply sections and the supply echelon of the leading army corps are interposed between the two corps. In the first alternative, the leading corps will get its supplies very late, obliging it to use its emergency ration on the first day when both corps are marching by the same road, because the supply waggons could arrive only during the night following the first day's march; in the second alternative, the corps in rear will reach its quarters correspondingly later. In both alternatives the troops have to miss their rations of fresh meat as a rule; but bread must be brought up at all costs by the daily supply echelon.

The whole movement can in any case be carried out only if it is done strictly systematically, and if time and space are most carefully calculated. Both corps must before all be placed under one command, all arrangements for the march, and for the supplies being uniformly regulated by one head. The troops must strictly adhere to the time prescribed for the marches. Halts, which should be brief, must be most carefully arranged in regard to place and hour, so that the march is not delayed for a single moment. Further, most stringent orders must be issued that no other vehicles except those authorized by regulations are found with any column. Every non-regulation waggon must be ruthlessly removed. It must be most distinctly forbidden to carry the knapsacks on waggons. No arrangements can be relied upon to work if the lengths of the columns are different from what the staff has calculated. Carrying the knapsacks on waggons had become a perfect nuisance sometimes in 1870–71, rendering all movements difficult. Lastly, all troops must be billeted or bivouac near the road itself on a depth of about 10 kilometres per army corps, to save the supply waggons some distances to go, and to facilitate their finding the troops rapidly, so that disorder may be avoided during the night when the waggons arrive.

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* *Vide* Major Matthes, "Marsch und Versorgung zweier auf einer Strasse vorrückender Armeekorps," *Vierteljahreshefte für Truppenführung und Heereskunde*, vol. i., 1910.

In Appendix III. is shown how two army corps are marching by one road. Appendix IV. gives the hours of starting and arriving. In the example it is assumed that the supply and baggage sections and the supply echelons for the day are marching behind the fighting troops of both corps, being brought up to them during the night. Long halts during the march are not allowed for there; but they must and can be spared, since fifteen minutes have been calculated as the rate of marching per kilometre. The supply columns have to cover daily 38 to 40 kilometres roughly. All other transport marches during the night, and must in case of need be brought to the front by forced marches. They must carry for themselves supplies for several days if possible. If ammunition columns and field ambulances are to march between both corps, the necessary space for them on the road must be obtained by either starting the leading corps earlier, or the corps in rear later. If we get a gap of one hour in this way, the leading corps can be followed, *e.g.*, by three artillery, and two infantry ammunition columns, and by six field ambulances.

The order of march and the hours for starting will be regulated by, and depend on, the special circumstances of each case, on the tactical situation, on the season, the condition of the roads, the weather, the efficiency of the troops, etc. But the necessary and most important basis of the method are the theoretical considerations and calculations of what is possible for the troops to perform, and what is possible to do for their subsistence. We must also steadily bear in mind that the whole method can only be carried through if the railheads are constantly pushed forward. If the railway lines cannot follow the troops in their advance, and if it is impossible to increase the lines of communication columns in proportion to the increasing distances between the army and its railhead, the connection between railway and depot is broken, and subsistence becomes impossible the moment the supplies at the depot are exhausted.

Though it is possible, therefore, to march two army corps by one road and supply them from depots, the difficulties and inconveniences resulting therefrom are so great that only dire necessity could induce us to adopt such a measure. Where the country is not altogether unfavourable, it will cause the troops less fatigue if arrangements are made to march the infantry on either side of the road, and all transport of both corps on the road itself. The whole method would be further facilitated should it be possible to march the columns on a broader front which would decrease their depth accordingly, and thereby greatly simplify their being subsisted.

If, on the other hand, the lengths of the army corps are greater still than here assumed, and should it be impossible to shorten either the march columns, or to march for any length of time alongside the roads, it would be sometimes advisable to march in echelons, that is to say, one army corps with all its columns and trains, or with at least the greater portion of them, is sent ahead, while the other is following in second line. Whether both corps could be constantly subsisted from depots by such an arrangement will depend on the particular circumstances of each case. If the empty supply columns of the army corps in the first line are to be refilled from depots situated in rear of the army corps in second line, the whole movement, if transport is carried out by draught animals, will be exceedingly slow. Such an arrangement is therefore feasible only, if either the leading corps can live on the country, or if it is possible to furnish it with provisions and other wants by rail past the corps in second line, as will often be the case in one's own country, or if the leading corps can be supplied from the rear by motors moving along the road the corps is marching by. The motor columns would in that case have to pass during the night through the corps in second line, and reach the leading corps in that way. But we have then to rely on great march performances from the mechanical transport trains.

Subsistence from depots becomes even more difficult when large columns are making a flank march. The regimental supply waggons as well as the supply columns must in that case move by roads parallel to the main line of advance; but communication of the former with the troops themselves must be carried on over cross roads. The provisions must be brought up to the troops from the side. The main road of advance must, if possible, be kept clear of all transport. The refilling points must also be fixed aside of that road. The advanced depot, accompanying the column as well on the flank, must be pushed after it by stages, All transport will have to make considerably longer marches, because, in addition to the actual march, the distances separating the parallel roads from the main road of advance must be covered twice over. Communication will be rendered more difficult owing to the cross roads used being often of an indifferent kind. Under these circumstances we will not be able to make long marches, and the refilling points must be carefully fixed with reference to the network of roads.

Retreat, again, causes difficulties of a different nature. Things seem to be simpler here, it is true, in so far as the troops are going back to their base, the supply waggons therefore escaping the necessity of making the double march to the depot and back again to the troops; but instead of this, we have to face other serious troubles. If we retreat voluntarily from reasons of strategy, and without having been in collision with the enemy, arranging for supplies is, of course, comparatively simple, even when retiring by another road than that we have been advancing by; in that case the whole transport is pushed over to the new road *before* the march is begun. But when we are retreating after a lost battle, regular subsistence cannot be established at all, until the troops and their whole apparatus for supply are distributed and strung out on the new roads we are marching by. So long as this is not yet done, the troops have to fall back on their iron rations. If the various army corps are able to withdraw by the same roads by which they had been advancing the matter is comparatively simple; if they have to use other roads, the columns and trains must carry out a lateral movement from the line of advance to the line of retreat, which, under the pressure of a victorious enemy may cause great difficulty if it is not carefully prepared beforehand.

As a rule, it is best to order the columns and trains to park during the battle, grouping them so that in case of retreat, they may have the necessary start. We place them, moreover, if possible at cross roads or forks of roads, whence they can be transferred readily to another road.

It is, further, a great advantage in all retrograde movements, if each vehicle can turn around on the spot. In that case we can initiate a retreat of the whole column at once during the march. If this is not possible, then the transport columns must either wheel round with their heads at a suitable place, all succeeding vehicles doing the same at the same spot, or they must form up in front and drive off again towards the rear. In the former instance, a double row of waggons will temporarily occupy the road, and in the latter double the time is wasted. Both may sometimes be fatal.

If the army corps is once established with its transport on the road it retreats by, and is far enough away from the enemy to act with a certain amount of freedom, it is a simple matter to regulate supply and ammunition being replenished. The supply and ammunition columns must then during further retreat deposit the necessary amount of provision and ammunition for the corps, at certain points, fixed beforehand, and then continue moving on by forced marches to reach the next depot and be available again refilled when the troops have exhausted the supplies of the other columns. In like manner the depots must withdraw, when necessary, by echelons. The supply waggons, if still laden, must, as a matter of principle, be emptied first, in order that they be used on the following days for distribution to the troops of the provisions obtained at the depots. It is an advantage if the marches can be fixed for a number of days ahead, and not from day to day, so that the arrangements for supplies can be made systematically. The way in which the troops are billeted is another important factor in retreat.

It is in the nature of retreat to remove all impedimenta of the troops in the direction away from the enemy. It is not difficult to remove the supply columns, trains, and depot columns if once they have the necessary start, but it is otherwise with the vehicles which must remain with the troops during night, that is to say, the baggage sections and supply sections. They must start earlier than the troops, and must have gained already a certain distance when these begin to move. The baggage sections march then straight to the billets or bivouacs assigned to the troops for the next night; and the supply sections first of all to the refilling points established by the supply columns, and then likewise to the new resting places of the troops.

If the troops were billeted for the night in the same depth as they had marched, they could not start again next day until the vehicles of the troops nearest to the enemy had marched through the whole billeting area, and then have covered, in addition, a distance of 3 to 5 kilometres at least, to get a certain amount of start. The time for the troops to move would, in such a case, have to be fixed at a later hour than the *military situation* might require, which, in a retreat more than elsewhere, is always the decisive factor. We have seen that it is desirable and necessary to make the corps close up for a night's rest when marching forward; it is, likewise, advantageous during retreat, to let the troops rest at night closed up if possible, and distributed more in breadth than in depth, so that the regimental transport can remain with the troops as long as possible, and yet start early enough for the troops to move at not too late an hour.

Every retrograde movement is, of course, felt in the lines of communication area, and sometimes even in the home territory. The lines of communication that had been pushed forward must be broken up and carried back. Field railways must be taken up and depots emptied. It will be therefore advisable, at least before the first great decisive battles, to keep the supplies for the army as much as possible movable, and to store them in magazines only at places absolutely safe—that is, in fortresses or in the interior of the home country ; otherwise we run the risk of seeing valuable stores necessary for the army falling into the enemy's hands, as happened in 1757 with the Austrian magazines in Bohemia, in 1870 with the large French magazines at Forbach, and in the Manchurian war with innumerable Russian stores and material. The railways must be kept at work as long as possible for evacuating the stores, and be blocked or destroyed, as the case may be, by the railway troops as late as possible. The thought of resuming the offensive must permeate all arrangements, including the disposal of the stores evacuated. Order must also be maintained with an iron hand throughout the retrograde movement, and all panic and precipitancy must be avoided. The rearguards must, by their resistance, procure the necessary time for an orderly withdrawal.

As in retreat so in pursuit will the question of supplies prove difficult. While in retrograde movements all depends on an orderly withdrawal and avoidance of precipitancy, it is in pursuit a question of making it possible to push after the enemy with the utmost energy, and nowhere to allow regards for subsistence to paralyze it. It will not often be easy to achieve this.

During an action the supply columns must halt some distance in rear of the battlefield ; ammunition columns and field ambulances are, however, moved up. It will, therefore, not always be possible to bring up supply vehicles to the battlefield. If the troops push forward in pursuit late in the evening they have to fall back on the supplies they are carrying with them. Even on the day after the battle, when the army spreads out again for further operations after concentrating for battle, regular traffic with supply vehicles cannot be thought of. Thus, every great battle creates at the same time a crisis for subsisting the troops, and it will not always be possible to push the supply vehicles after the pursuing troops by the roads encumbered with ammunition columns and transports of wounded.

The only means available for overcoming this crisis are the *iron* and *reserve rations* carried by the men themselves. These rations alone can help us at such moments; *they become all the more important when large masses are engaged and difficulties of subsistence consequent thereon become greater.* These rations are, in fact, the most important piece of baggage carried by the soldier in modern war, and it is of special advantage if the soldier not only carries a large number of such rations on him, but that they be replaced as rapidly as possible. It would be desirable if, in addition to the contents of the travelling field kitchens, the troops had always three such rations, to replace which it would be necessary to form special light columns. These could march at ordinary times with the divisional ammunition columns and supply parks, but must be brought up closer at critical moments, and ultimately on to the battlefield itself, so as to rapidly effect replenishing the used-up rations, thereby guaranteeing the mobility of the troops in difficult situations. We need hardly mention that at such moments the troops must be satisfied with the barest necessities although the greatest exertions are demanded from them.

The question of emergency portions and rations also deeply concerns the cavalry. Its subsistence must be considered separately because it cannot be effected in the same systematic manner as with the other troops. The cavalry being obliged to cut itself adrift at times from all lines of communication, abandoning in such case all chances of being supplied from the rear, it must be able to carry supplies for a certain number of days at least. It must be able to subsist until it has regained its communications, or made sure of supplies in the enemy's country. If we keep these points in view, it must be granted that *the* arm, the chief advantage of which is its rapidity of movement, should also be equipped with rapidly-moving supply columns.

In former times, when the cavalry was of importance chiefly by its shock tactics, and was therefore marching and resting as a rule with the infantry, it was possible to organize its transport service on similar lines to that of infantry. From that time originated the heavy forage and baggage waggons with which it is still very often equipped. But, to-day, matters are quite different. To-day the cavalry is valuable chiefly on account of its strategic mobility and the enterprises it can accomplish *independently.* It must therefore be provided also with a transport service harmonizing with its activity, that is to say, with a transport moving as rapidly and as widely as the troops themselves. *Only if this is so can we expect the cavalry to perform anything worth mentioning. Otherwise,* apart from the divisional cavalry, it is more likely to be a mere *encumbrance* to the army.

To assume that cavalry can subsist on the country is pure self-deception. Especially at the beginning of the operations with the great masses, the cavalry is bound to move in districts almost exhausted, where it will not find the necessary food and fodder; but similar conditions will, as a rule, prevail when the cavalry is operating on the flanks and in rear of the enemy. If by chance supplies are actually to be got, it must be procured by requisitioning, a procedure which seems to me apt to paralyze completely all active operations of the cavalry. During long marches time and strength will not suffice at all for requisitioning. We need only think what it means to collect oats every day for a cavalry corps in addition to its active operations. It will, as a rule, have to march and rest concentrated in rear and on the flanks of the enemy, unable to detach requisitioning parties to any distance without risks of losing them altogether. Owing to the low strength of the German cavalry divisions, it is not at all permissible to weaken them by numerous detachments of this kind, because the fighting power of the division would be reduced in a manner entirely inadmissible. Requisitioning would therefore either prove an utter failure, especially in a country little populated like Russia, or efficiency to operate would be completely paralyzed by the system of supplies.

In the war of 1870-71, though waged in rich France, the cavalry was forced to carry a supply of oats for several days on requisitioned vehicles, to be able to move; but the cavalry's rate of marching depended here on the rate the improvized columns could go, and this rate prevented the cavalry from carrying out extensive operations rapidly. It seems to me exceedingly doubtful whether this method can be repeated in a future war. The cavalry will not find the requisite waggons at all in the much-tried country between the two opposing armies; the modern armies of masses will have called up all suitable material for its normal formations. But even assuming the improbable case that vehicles and forage are found, these columns would be as little able to follow the cavalry on their rapid and long marches as in 1870. The mobility of the horsemen would anyhow be always extremely limited.

If we wish the cavalry to operate independently and effectively, nothing else is left, in fact, than to equip it with a transport service harmonizing with its peculiar action, therefore altogether different from the transport service of the army. That service must be able to accompany the cavalry at all times, everywhere, on bad roads as well, and at a rapid pace. The length of the column is a matter of indifference; mobility is the main thing. The vehicles must, of course, be able to turn round instantly. This is the only way they could come up to the requirements they may be called upon to meet.

If the cavalry advances independently into the enemy's country, it must not leave its transport too far behind if it wishes to use and *protect* it; circumstances may arise even forcing the cavalry to keep its trains in closest touch with the troops. On the other hand, cavalry may very well find itself in situations obliging it to turn round suddenly and retire rapidly, and this not only when it has been beaten. If a column of horsemen encounters a superior enemy it will often have to give way until reinforcements arrive. If in such a case the transport is unable to follow the movement it runs the risk of falling into the hands of the enemy. The necessity for great mobility, not on roads alone, but, for short distances at least, also across country, follows further from the fact that the supply waggons at least *must* reach the troops daily. The riding horses cannot carry an emergency ration on account of the weight; the men for the same reason, carry only *one* iron ration. Man and horse are therefore almost entirely dependent on the supply and forage waggons.

It would be highly desirable to furnish the cavalry divisions with forage in a concentrated form. Compressed into a minimum of space, this forage should contain all the substances requisite for the subsistence of the horse, be transported easily, and be produced in a form making it possible to supply patrols sometimes with such rations. Forage of this kind would make it easier for the army cavalry to operate for some days at least, independent of its lines of communication and of its cumbersome forage columns. Important problems wait here to be solved, far too little importance being attached to them generally.

In addition to supplying the troops with provisions the transport of ammunition is of special importance. But the demands made upon commanders in arranging for ammunition supply, and the performances required from the ammunition columns, are not so high as those in regard to provisions, because the supply of ammunition is not needed constantly and regularly, but becomes necessary only after battles and actions, and because the troops themselves carry a very considerable amount of it with them.

If, owing to the proximity of the enemy, actions become imminent, parts of the ammunition columns which, as a rule, follow at some distance in rear of the troops, are ordered up by rapid marches and then follow directly in rear of the troops. The rest of the ammunition columns are brought up closer to the battlefield during the action itself to help to replenish in case of need. All empty columns march back at once to refill at the depot. The lines of communication authorities are chiefly concerned with the difficult task of bringing up ammunition from the base.

Ammunition is forwarded from the home country by rail, in special ammunition trains. They pass the collecting depot, as a rule, without stopping, and are placed at the disposal of the lines of communication authorities. These latter have to see that the ammunition depots are constantly being pushed after the troops, close enough to the advancing army to prevent the empty ammunition columns of the corps from having to make excessively long marches to the depot and back again to their place behind the army corps. Ammunition is replenished during retreat, in the same way as are provisions—that is to say, depots are established on the line of retreat, where the troops can refill. It is best to keep the ammunition reserves, which the lines of communication authorities forward to the troops, as much as possible mobile, so that, in case of retreat, no great evacuations are needed.

Lastly, as regards transport proceeding from the army to the lines of communication area, it is concerned chiefly with wounded and sick. For their removal it will be best to use all empty vehicles returning to the lines of communication area, the columns of the corps handing over these men to the lines of communication columns, which in turn conduct them to the nearest hospitals or rail-heads, whence they are sent home in empty or special ambulance trains. The lines of communication authorities take care that field hospitals are pushed after the troops. Special measures must, of course, be adopted when great numbers of prisoners, wounded, or spoils of war have to be evacuated, the same as will be necessary when siege trains have to be brought up; transport of this kind cannot be effected by the ordinary means available with the troops and on the lines of communication.

Taking all in all we can easily see that the main difficulty is the question of *subsistence*, because the mechanism necessary to uphold it must never cease to work, and can only meet all demands if systematically arranged, which is not easily done during the ever-changing phases of a war. So long as the transport service is restricted to working with draught animals, freedom of movement is greatly limited, because the distance the armies can move from their railheads is determined by the number of supply columns available. There is always the danger, too, of the efficiency of the draught animals failing if march performances must be exacted beyond a certain average amount.

From this, it follows, next, that we must never estimate the number of animals required by the number of regulation teams prescribed, but that from the outset we must allow for a strong reserve of animals, to make good natural waste, to meet unforeseen demands, and to give these formations, as well, some days of rest during operations.

The number of useful draught animals at home will scarcely suffice to meet the barest demands, at least, not in Germany. Early forethought, therefore, must secure contracts in foreign countries. This will be all the more necessary, as we shall for certain not be able to make good the waste in horses in the enemy's country, as was often possible in France in 1870–71. The hostile army will have claimed every draught animal it could lay its hands on, so that we shall find the theatre of war empty of this supply, too.

The greater, therefore, the difficulties and inconveniences resulting from being restricted entirely to draught animals for bringing up supplies, the more we feel a desire of replacing a portion of the transport service by mechanical means.

And so, we first of all take care to make use of the railways as far as possible. The lines of communication authorities will do all they can in the enemy's country to repair and work the railways the enemy may have destroyed. Plenty of railway troops and railway-building companies must for that purpose be placed at their disposal. Where, during the further advance of the army, the railways are commanded by hostile fortresses or forts, the capture of which will probably take some time, railways, turning them, must be constructed. Where the railway net is altogether insufficient to satisfy the wants of the army, or when too many difficulties are encountered in repairing the trunk lines, field railways must be laid along the lines of advance trom railheads. There is no occasion in this case for being too pedantic in constructing such railways. They are not built to last for ever, and must occasionally be rapidly taken up again. Sometimes horse traffic must suffice for them, at least, until time and circumstances permit the line to be worked by, or constructed for, steam traffic. Rapidity of construction is the first object. If the line to be constructed is long, we must try to begin building it at various points simultaneously. We must always bear in mind that the forward movement of the army is directly determined by the advance of the railway. The *average* daily progress of the army cannot be greater than the length of field railway that can be laid and completed for traffic in one day. Even by the use of this adjunct, the freedom of operations is still somewhat limited, and, the more limited, the greater the number of army corps which depends on this railway. We, therefore, try to follow each corps, if possible, with one field railway line, provided material and personnel are available to build it, which is, of course, not the case to an unlimited extent. The field railway restricts to some extent freedom of movement, because it is a fixed line of communication, and it takes a comparatively long time to shift it. The field railway cannot be laid, therefore, close in rear of the troops in all situations, but must generally keep to districts in secure possession of the army.

Freedom of movement becomes much greater by the use of motors. These, it is true, are restricted to metalled roads, but can move by them in all directions. They will be used in the first instance on the lines of communication, to fill and push forward the advanced depots. If we can secure a sufficient number of these vehicles, they could replace a portion of the corps supply columns. We then need not follow with the advanced depots so close behind the troops as is necessary with draught animal columns, because mechanical transport moves faster and covers greater distances. If the army corps of an army are marching by roads of varying nature, some of which can only be used by motors, the latter can use, if feasible, the best roads, leaving the indifferent roads to the horse waggon columns which we have saved thereby, and raising in this way the total performance.

Motors may become a valuable adjunct to the army cavalry, the subsistence of which we have seen meets with peculiar difficulties. The motors being confined to some kind of metalled roads, could certainly not follow the cavalry everywhere, but they have instead the great advantage of rapid motion. They can be built to turn round on the spot, and thus escape the enemy by rapid retreat. The operations of cavalry being on the whole carried out along the existing roads, the motors could easily follow the divisions as a mobile supply reserve on roads suitable for them. But communication between them and the troops must be kept up by light horse waggons. For rapid communication of the advanced cavalry with the supply reserves carried with the army, motor waggons of this kind would be specially suitable. The men escorting them must of course be armed, and able to ward off patrols and small raiding parties of the enemy.

If we now survey all that belongs to lines of communication, the most important features of which I have tried to depict here, it becomes clearly and convincingly apparent how highly important these conditions are for all effective operations of armies. We may therefore be sure of the enemy trying to cut the lines of communications, to capture the stationary and movable magazines, and to destroy the railways in use whenever he sees a chance to do so. The hostile cavalry will, above all, attempt destruction of this kind, if it understands its modern duties rightly.

We shall be obliged to guard the lines of communications against such enterprises, which must be made in strong force, if they are to succeed; in the enemy's country we must also guard these lines against attempts to destroy them, made by the inhabitants and irregular troops.

The measures of security must, under these conditions, be of a double nature. It will be first of all necessary to guard directly with garrisons, posts, and patrolling the main points on the roads and railways forming the lines of communication, of which bridges, tunnels, and other artificial structures are the most important objects. But, in addition, strong detachments of all arms must be available to oppose extensive hostile enterprises. It is, however, evidently unnecessary to keep in readiness such mobile forces within the whole lines of communication area. As a rule, it will be sufficient to garrison the larger towns and important traffic-centres. For the rest, mobile troops will be concentrated only in districts exposed to hostile enterprises, therefore particularly on the open flanks of the lines of communication area, where the inroad of hostile cavalry may be first expected. The latter must be met offensively if possible, for the offensive is here, too, the soul of defence.

Care must therefore be taken to supply the lines of communication authorities with sufficient cavalry, whose duty it will be to patrol far into districts unoccupied by us, and to ascertain early any hostile approach. The lines of communication defence troops can then be concentrated in time and be led against the enemy.

The lines of communication authorities can only carry out their duties fully if, by timely and resolute action, they succeed in *preventing* any disturbance of the lines of communication area by hostile raids, so that nowhere traffic may be interrupted. A proper organized intelligence and communication service in the whole area of the lines, and advanced posts in directions where danger threatens, will be of special use in solving this task.

CHAPTER VII

METHODICS IN MOVING ARMIES

Influence of modern conditions on the movement of armies, p. 270—March performances, p. 271—March performances of cavalry, p. 273—Advance and retreat, p. 274—Contracting and spreading out during advance, p. 276—Flank march of an army, p. 278—Wheeling with an army, p. 281—August 26, 1870, p. 288—Changing front with large armies, p. 289—Preparing the movement by echeloning, p. 290—Objections against strategic marches to the rear, p. 291—Flank attack, p. 293—Defensive measures against flank attack and deployment, p. 294—Influence of advanced detachments on operative movements, p. 295—Influence of special circumstances on the operations, p. 297—Influence of ground, passing defiles, p. 298—Retreat through defiles, p. 301—Pursuit, p. 302—Extending again after a victorious battle, p. 305—Pursuit with the whole army, p. 306—Retreat, p. 307—Concentric and excentric retreat, p. 310—The inner line, p. 311—Co-operation of individual armies within the compass of the whole army, p. 318.

THE depth of the march columns of modern armies, and the impossibility of subsisting the masses of the armies of to-day by the means found in the theatre of war itself have led, as we have seen, to systems being adopted for marching and supplying troops totally different from what they were before. The same conditions have naturally a decisive influence on the combined movements of armies. The size alone of the mass itself calls for a distinct system and well-arranged method, so that disorder and crossings may be avoided. The difficulty of subsisting the deep columns from the rear makes it necessary to march the army corps, if possible, on parallel roads, so as to avoid excessive organization of the armies in depth. Being dependent on depots and railheads, freedom of movement, with numerous columns marching parallel to each other, is bound to be still more limited than with a single army corps. When concentrating and unfolding, wheeling, deploying, and executing flank marches, we must thoroughly take into account the lines of communication, so as to avoid overcrowding the roads, crossing of trains and supply columns with each other, and disturbing the regular routine of the supply service. In all these movements we must proceed by some definite method if we wish to make a thorough use of time and space; and we must not only do this when dealing with a single army, which may consist of three to six army corps, but also when several such armies are operating together with a common object. To shift about in an arbitrary manner some of the units of modern armies is absolutely impossible, at least during active operations, if we do not wish to create chaotic conditions like those which were so often prevalent in the Russian army in the Manchurian theatre of war.

We must, therefore, be perfectly clear about the method of moving army groups and armies, so as to direct their operations in an orderly and practical manner.

First of all, it is important to be clear about the *march performances* we can expect and exact from army groups of some size. Many authorities are ot opinion "that the current notion about a day's march of three miles* or 22·5 kilometres no longer holds good in our days. Cases might easily occur to-day when double that amount must be exacted, and when we must march all day, or even at night with rests between."† Cases like these have always occurred, and will no doubt occur again in future. The troops must perform, and will perform to-day as formerly, what must be exacted from them on such occasions. But the opinion that in modern war march performances *altogether* greater than formerly must be demanded is, I think, wrong. The idea is obviously to make up for the slowness of wheeling, forming up, and similar movements—caused by large numbers—by increasing the average march performances: but this is infeasible.

In the previous chapter we have proved that where large bodies of troops are concerned, the march performance depends essentially on the possibility of subsisting the troops regularly from the rear. The explanations given there show that the depth of the column and length of the march mutually affect each other in a distinct manner, and that the marches must not altogether exceed a certain average if the supply waggons are to reach the troops daily in time. The progress of the forward movement is limited by these conditions, and anyone wishing to determine the march performance of an army without paying regard to them, would very soon find out the mistake he made in his calculations. The marches need not be of equal length from day to day of course. In critical situations we can, for a short time, dispense with supplies from the rear, live on the iron rations, and thus materially increase the march performances. But it will then always become necessary to shorten the subsequent marches proportionately, or to interpolate rest-days, in order to re-establish systematic traffic with the lines of communication, and thus regular subsistence. The latter will always determine the *average performance.* No art of leadership or management can get rid of this check. It is therefore extremely dangerous to reckon with great march performances when planning operations. The temptation to do so is great, and so we greatly sin in this respect in all theoretical exercises, without, as a rule, rendering to ourselves a full account of the permanent dangers which are sure to arise therefrom.

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* Geographical miles, equal to about four and three-quarter English miles.—TRANSLATOR.

† General Freiherr v. Falkenhausen, "Die Massen im Kriege," *Vierteljahreshefte für Truppenführung und Heereskunde*, vol. i., 1911.

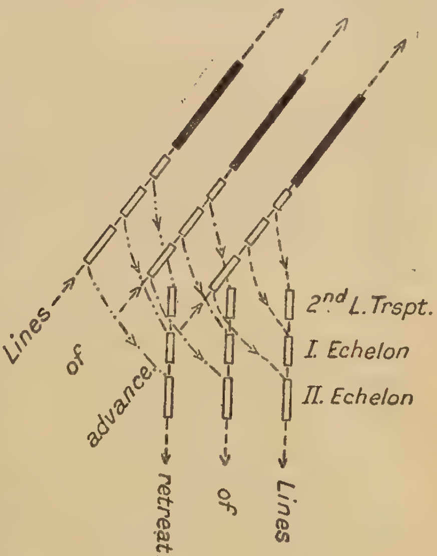
I do not believe that with regular subsistence from the rear, including rest-days, we can attain a greater average performance for any length of time, than 15 kilometres daily. Anyhow it is as well not to reckon with greater march performances generally. Experience of war confirms this fact, too. If we should try to subsist the modern armies of masses, as formerly, on the country, the average performance would be even still further reduced, because the march performances of various units would be increased by the many and wearisome marches they would have to undertake for requisitioning, and we would be always obliged to fall back again upon the supply columns, and wait for their arrival to help us.

Nor must we make too high an estimate of the possible march performances of cavalry. At war games, and also during manœuvres, quite fantastic distances are often calculated for the expeditions of that arm. The reconnoitring squadrons ride in one day 100 kilometres, the main body 50 to 60 kilometres, and the patrols even still farther. Such marches are absolutely impossible for any length of time; but as a single performance they are not only useless as a rule, but positively injurious. By wrongly interpreting the interests of one day, marches of this kind exhaust the cavalry to such an extent as to prevent it for some time from carrying out its duties in the face of the enemy; and they make reconnoitring a delusion, the patrols being, of course, unable to send back information, after having covered more than 100 kilometres or similar distances.

We must, therefore, be satisfied with average performances of the cavalry as well, and will derive permanently more advantages from it by not overworking it, than by exacting from it too much at the outset. If the main bodies march 30 to 40 kilometres, if the patrols cover distances of 60 kilometres, and if the reconnoitring squadrons move within the zone of these two groups, it means an exceedingly high average march performance, which will be even higher if we bear in mind the distances the mounted orderlies will have to cover in that case.

As regards, now, the method to be adopted in arranging the marches of groups of large armies, the conditions are simple if the army is merely marching forward on a front permitting a particular road to be apportioned to each army corps. In that case, the arrangements for the march and supplies are regulated by the depth of the columns of troops as we have shown already. Just as simple are the conditions when we are retreating by the same roads. The troops withdrawing, in this instance, upon their reserve of supplies, their subsistence causes no difficulties at all. If the army is to be led back by other roads, obliquely to the former lines of advance, the troops, as well as the trains of all army corps, must be simultaneously moved over to the new roads.

SKETCH. I.



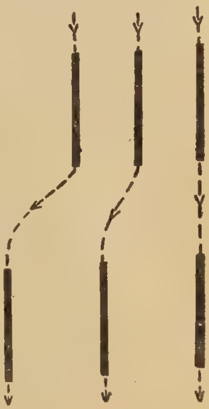
As a rule, it will then be necessary for all the trains of the army corps to turn off to the line of retreat, with as many heads as possible from the roads the columns were advancing by. Space and time must be calculated in such a way as to bring about the same organization and sequence of the various units on the new road, as existed during the advance. The length of the marches must also be fixed so as to include in the whole march performance the time taken in carrying out the lateral movement, the longest lateral movement thus determining the length of the whole march. The depots must proceed in a similar manner too, when the lines of communication are being changed. It will be always advisable therefore, if possible, to initiate the transfer of the lines of communication before the troops themselves begin to retreat.

If, during an advance, closer concentration for battle is to be brought about because considerable organization in depth is thought necessary for carrying through the battle, it can be attained in a twofold manner: either by drawing the columns closer together during the march forward and increasing the depth by decreasing the front, or by making a second army echelon follow the first, thus marching several corps by one road, and doubling the depth not only for the march, but also for the battle. The latter arrangement always causes great difficulties to march technics, as we have seen already. It has also tactical disadvantages.

If the corps arrive on the battlefield one after the other, we have to use them in echelons, leading to a mixture of all units, and rendering command very difficult. The advance of the second corps, arriving late at Gravelotte, is an instructive example of this sort. If we wish to avoid this evil we must bring up the corps from the rear abreast of the others before the battle and lose, accordingly, time for the attack.

We shall therefore, if ever possible, choose the method of making the various army columns draw closer together by a converging movement towards the battlefield, and try to bring about in this way the desired density of concentration. It will then, of course, often happen that the roads do not suit the tactical requirements, not enough of them, as we think we need, converging to the probable battlefield. We must then fall back again upon the device of marching several corps by one road, or marching some columns across country. This procedure is generally preferable. We can very well use this means for one or two days' marches to attain the requisite grouping of the forces when concentrating for battle. It is, at any rate, more practical to make use of this means than to become a slave to the network of roads, and make the tactical decision, perhaps, also dependent on it.

SKETCH. 2.



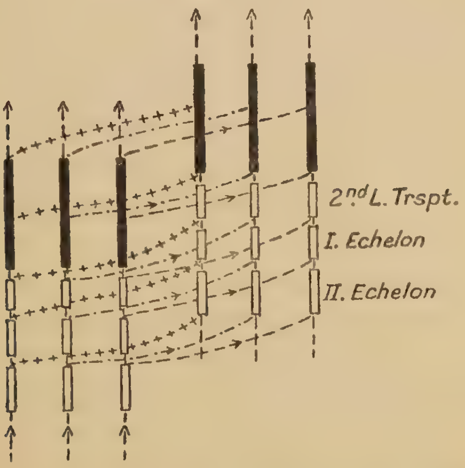
Contraction at one spot will naturally entail expansion at another, if no gap is to occur in the front line of the army. This operation is carried out by the army corps concerned turning to the side with a wheel of their heads, the marches of the various columns being lengthened or shortened sufficient to prevent echelons being the result, and the heads of the columns from losing their alignment. Baggage columns and trains conform to the movement. The lines of communication of the corps are shifted, if necessary, by the authorities concerned. Should the lines of communication areas of the various armies in such a case expand or contract, General Headquarters must order the necessary arrangements, and the lines of communication authorities concerned must agree among themselves how best to carry into execution the measures prescribed. This holds good in all cases where the lines of communication of armies have to be shifted, and what I have just stated will therefore not be repeated each time in the succeeding pages.

For the rest, the movements so far discussed are comparatively easy to execute. Real difficulties only arise when armies must carry out flank marches, wheels, and deployments, especially towards a flank. Flank marches in particular necessitate complicated measures.

If, in carrying out a flank march, we would march the army in one column, like a single corps, that column would be of a length totally out of proportion to its original and intended breadth of front; departure and arrival on the new alignment of each individual army corps would have to take place successively, and the whole operation would take so much time as is not likely to be ever available in a strategic situation necessitating a flank march. The gradual transfer of the lines of communication, while subsisting the troops from the rear at the same time, would be an extremely troublesome operation difficult to carry out in practice. We must therefore proceed by another method.

The army must make a right or left turn in itself, carry out the lateral movement in this formation, and then reform the front by a turn in the opposite direction. The operation would be carried out by each march column wheeling with different portions into the new direction, marching laterally in this formation until the movement is finished by the new line of advance being reached. Having arrived at the fresh line of advance, the heads of the various portions of the columns wheel again into the previous direction of the front, and re-establish the march columns of the corps on one road. The number of columns with which the flank march is carried out, is settled partly by the number of transverse roads available, partly by the distance of the original march columns from each other, but in such a way that the depth of the army flank during the lateral movement is of the same length as the front the army occupied before the wheel, and is again to occupy after the wheel. Should it happen that the front is narrower than the depth of a column assigned to one road by which to carry out the flank march, we can manage by either shortening the march columns or marching some units across country, or lastly, by making the various columns of the army begin the lateral movement by degrees. The latter procedure is, of course, only possible if comparatively short distances have to be covered, else the movement of the army as a whole would be retarded.

SKETCH. 3.



During such a flank march great difficulties arise regarding the movements of the baggage and supply columns; but they can be overcome. It would greatly ease the troops if it could be made possible to follow with the baggage sections and a supply unit directly behind the individual columns during their movement towards the flank; but, of course, this is only feasible if the enemy is still at some distance. It will technically be possible to arrange for this if the movement is initiated from night quarters, to where all vehicles can be brought up which are to accompany the columns, and if these latter can be made numerous and short enough during the flank march to prevent the army extending too much with the necessary vehicles even following directly in rear of the various columns. In this way we can march briskly forward and fully use the marching power of the troops, as we scarcely need pay any attention to the few vehicles following these short columns.

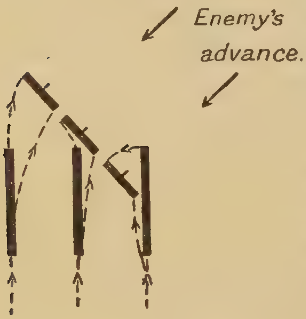
If for one or the other reason such an arrangement is impossible, the whole transport service must carry out the lateral movement by the same principle as the troops, but away from them. The latter must then either subsist on the iron rations and the country, and spend the night without their baggage sections, or the marches must be arranged short enough for the supply sections, at least, to come up and leave again during the night in spite of the lateral movement. The more the march columns have closed up towards the front before the flank march begins, the easier it is to carry out the latter arrangement, because the distances will then be shorter which the transport that is to come up has to cover. For all that, it will materially delay and render the whole movement difficult, if only draught animal columns are available. But if we have at our disposal suitable motor waggons, subsistence during the flank march, as well as rapid replenishment of any iron rations spent, is possible without causing too many difficulties. The speed of these vehicles will in such a case be of decisive importance.

Subsistence will be greatly facilitated if it can be prepared beforehand by an early intimation of the contemplated movement. Such preparation is absolutely necessary if extensive flank marches are involved, necessitating also the lines of communication railways of the army corps to be changed; this will entail very great alterations in the whole traffic. But so long as the army which is carrying out the flank march is restricted to the railway lines originally assigned to it—as will be the case generally during the opening stages of the campaign—the movement to the flank altogether is possible only within certain limits, if we do not wish to give up all communication. In such a case, an early concentration and advance of the requisite mechanical transport columns will greatly facilitate the whole movement.

If a flank march can be executed with large bodies of troops by their columns moving *simultaneously* to one side, a wheel is again an operation occupying a time which grows with the breadth of the front wheeling, and is very considerable with large armies. It may therefore easily happen that the inner flank is being threatened by the enemy while the neighbouring columns and the outer flank are still wheeling. A neighbouring army may also be attacked and beaten by the enemy before the wheeling army is able to support it with all its forces. It is therefore always a question of quickening the movement and shortening the time for the new front to be established.

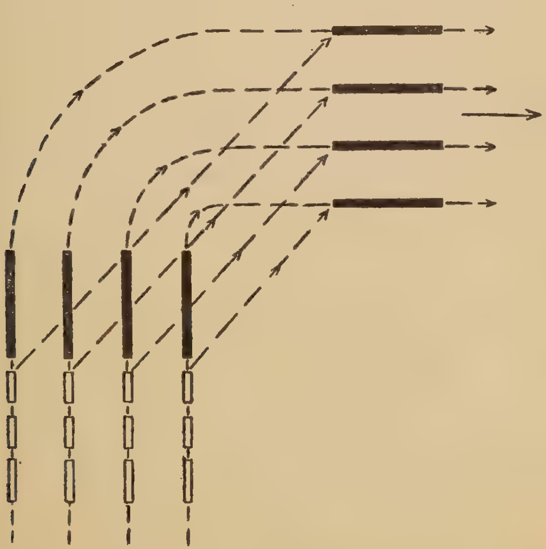
If this is to be attained by merely accelerating the march of the outer wing, this acceleration, as with all marches, will depend on the possibility of supplying the troops from the rear, and the object be attained to a limited extent only. But the whole movement will proceed quicker if it is possible to make the head of one of the centre columns the pivot for the wheel, and not the column of one of the flanks. The distances to be covered by the corps wheeling on the outer flank will be materially shortened thereby, but the corps on the inner flank must establish the new front by retracing their steps accordingly or by closing up to the rear if an attack by the enemy seems imminent. If the march is to be continued after wheeling, a partial transfer of the lines of communication may become desirable (Sketch 5) to shorten the distance for the transport service, by not following the curve of the wheel, but by cutting straight across it along the chord.

SKETCH. 4.



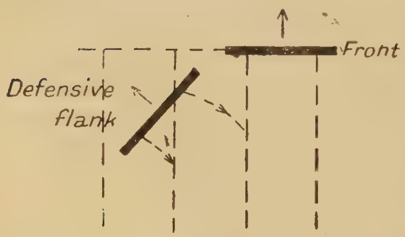
If portions of an army are to wheel backwards as may happen, for instance, and has repeatedly happened, in the face of a hostile envelopment, the movement is carried out as in a wheel forward; but regulating supply will cause very much greater difficulty than during advance. It will be necessary here to transfer the lines of communication completely, and as these will then converge with those coming from the front, some rather difficult conditions may be the result. We will often be obliged to make the lines of communication of several corps run into one and the same road, which may be fatal, especially in a case of retreat. Strategic arrangements of this sort are in any case rather disadvantageous.

SKETCH. 5.



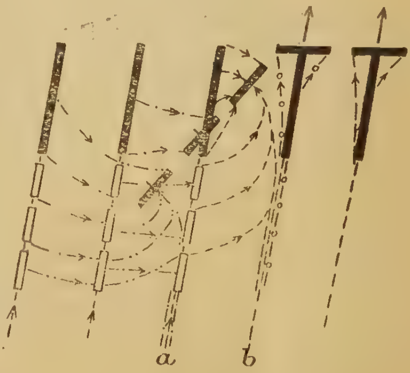
The wheel itself must be executed by the troops on as broad a front as possible, so as to accelerate the movement, and preserve as high a state of preparedness for action as possible. The columns and trains, split up into numerous fractions, must at the same time, be moved over by forced marches to the new lines of communication. They will often have to make almost a flank march behind the front of the army. To accelerate the movement it may sometimes be of advantage when wheeling to the rear as well, to fix the pivot for the wheel in the centre, and make some of the troops of the inner wing wheel to the front.

SKETCH 6.



Every wheel can be initiated by echelons; the wheel is then divided into two phases, as it were. The whole movement is not accelerated by this procedure, but we can thereby ensure the part of the movement which must be made sometimes in close proximity to the enemy, taking less time than if we carried out the whole movement at once.

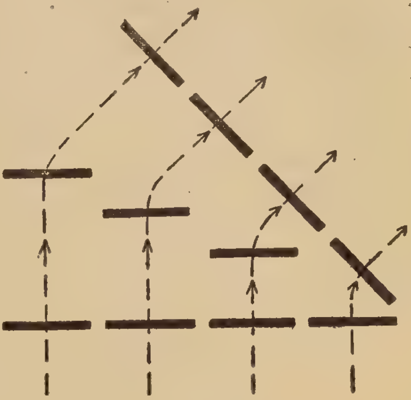
SKETCH. 7.



Sometimes it may be necessary, while marching forward, to wheel towards the flank, and to combine the wheel at the same time with a lateral movement, causing the wheel to be carried out, so to say, with a movable pivot.

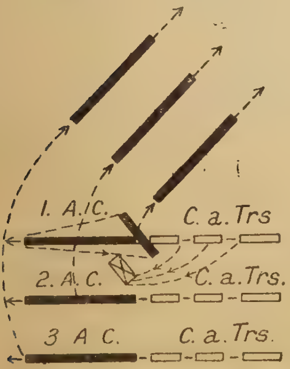
Such a case arose when the Third and Maas armies in their advance on a broad front on Rheims, were to march with a half turn to the right rear on Damvillers to oppose the army of MacMahon there, jointly with some army corps coming up from Metz.

SKETCH. 8.



If the question is asked how it is best to proceed in such a case, we must first of all examine the conditions theoretically. Putting into practice the theory recognized as correct depends on the existing network of roads, on the action of the enemy, and on other special circumstances; the practical execution will be subject to all kinds of modifications. It is the business of the general-in-chief to adapt the special measures demanded by the occasion to the requirements of the system; but if he intended to act without the guidance of a distinct system, the masses of modern armies would only too easily get into confusion, paralyzing all offensive power and mobility.

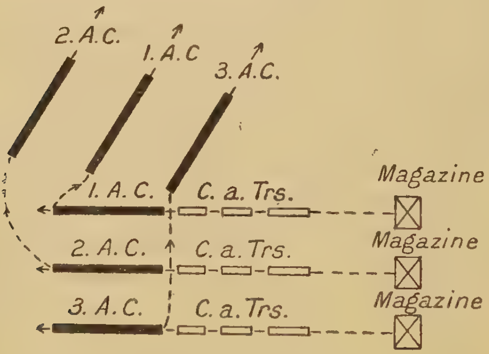
SKETCH. 9.



Theoretical considerations make us perceive that all arrangements for marches must change with the number of columns marching parallel with each other.

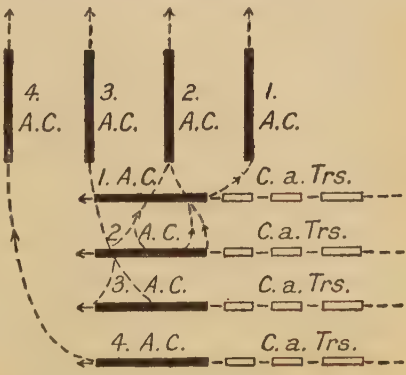
With three columns the procedure is comparatively simple. The army corps on the inner flank must concentrate on its rear, and then turn in the new direction bringing up all columns and trains so far as they are not engaged in moving to the depot, and placing them behind its new front if threatened by the enemy. The two outer corps simply wheel with their heads into the new direction or turn off with any portion of the column where a road going in the new direction branches off. But the outer corps must not cross the new line of advance of the centre corps. As soon as the second and third corps have come up to the level of the first, the latter resumes its march as well. The whole procedure is almost equal to a simple wheel. No change in the position of the lines of communication to each other is needed.

SKETCH. 10.



The same result may sometimes be obtained even quicker by forming upon the corps which is to be the pivot of the wheel. In that case the roads of the various columns will certainly cross each other in all sorts of ways according to the manner in which the forming up is executed, and the lines of communication of the various corps must be shifted. If the operation is carried out as shown in Sketch 10, the first corps will get the line of communication belonging hitherto to the second corps, handing over its own line to the third, the second corps, again, taking over that of the third. March columns crossing each other, can, nevertheless, be avoided if the trains and columns partly use the night for marching; changing the roads will of course cause some inconveniences, which, however, can be got over. If, in 1870, the Germans had wished to proceed in the above-mentioned operation as here proposed, they could on August 27, the day of the march of the leading echelon of the Third Army to the right, have placed the Eleventh Corps on the great road Vitry-le-Français—St. Ménehould, moved the Fifth and Sixth Corps up to the right and left respectively, and marched them forward by the existing local roads. The whole movement would have run smoothly, and the army would have been ready for action on the 28th and 29th.

SKETCH. 11



The thing is quite different when four army corps are marching parallel with each other. Here, if columns are not to cross each other, and yet the movements be executed in the shortest possible time, the corps on the inner flank must at once order the heads of its columns and trains to halt, march back itself a day's march and then turn its new heads into the new direction of advance. But the other three corps can proceed as in the first case. The second corps it is true, must cross the road of the first corps in this case, but by cleverly arranging the time and the marches delays can nevertheless be avoided.

A situation, as here discussed, occurred for instance on August 26, 1870, with the Twelfth, Fourth, Guard, and Second Bavarian Army Corps when they were ordered to march on Damvillers. If at that time the Germans had proceeded in the manner here proposed,* the whole movement would have developed very simply from a technical point of view, without disregarding strategic necessities, and no difficulties whatever would have arisen for the trains, columns, and subsistence. The Twelfth Corps with its rear at Lempire could have crossed the Maas at Ancémont-le-Grand, and turned by Eix on Gremilly. The Guard Corps could have started from Erize la Petite, where its rearmost troops were standing, march by Souilly, past Nixéville, on Froméreville and Charny, cross the Maas there and continue on Ville. Any crossing of the Twelfth Corps' tracks could be easily avoided by a proper timing of the marches. For the Fourth Corps was available the road Laheycourt—Villotte—Vaubécourt—Fleury—Dombasle—Montzéville—Chattancourt—Samogniaux—Crépion; and, for the Second Bavarian Corps the road from Charmont or Brabant-le-Roi by Laheycourt—Triaucourt—Fleury—Froidos Clermont—Anocourt—Malancourt—Consenvoye—Damvillers. In this way it would have been easy for

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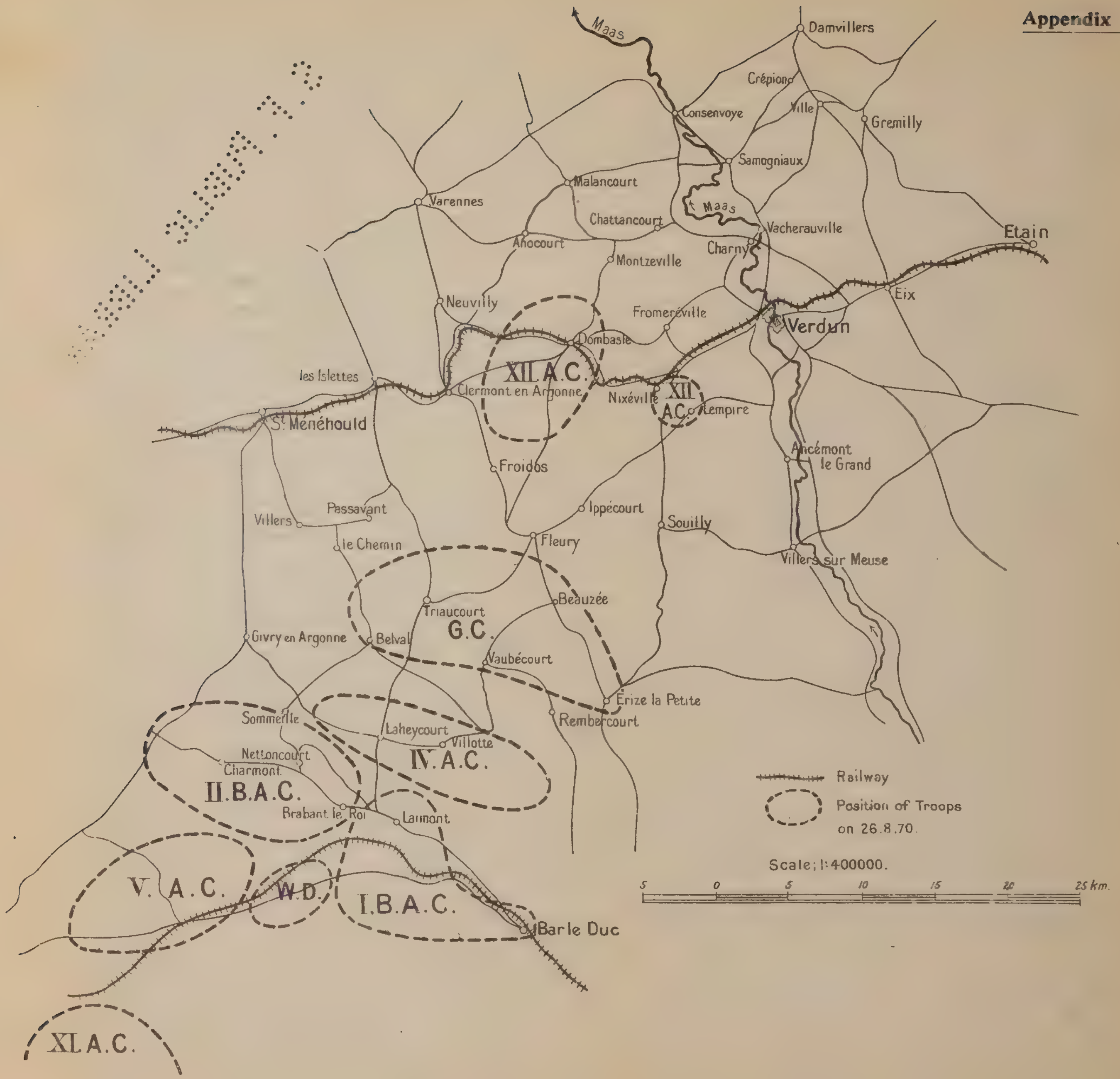
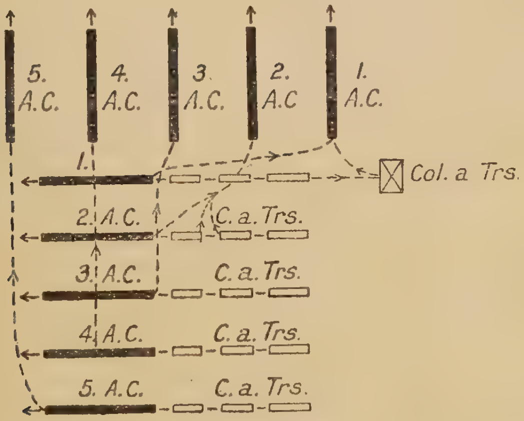
* *Vide* Appendix V.

Appendix V


Maas
Damvillers
Crépion
Ville
Gremilly
Consenvoye
Samogniaux
Malancourt
Varennes
Maas
Chattancourt
Vacherauville
Etain
Avocourt
Charny
Montzeville
Neuvilly
Fromeréville
Verdun
Eix
Dombasle
XII. A.C.
les Islettes
Clermont en Argonne
Nixéville
XII. A.C.
Lempire
St. Menéhould
Froidos
Ancémont le Grand
Passavant
Ippécourt
Villers
Souilly
le Chemin
Fleury
Villers sur Meuse
Beauzée
Triaucourt
G.C.
Givry en Argonne
Belval
Vaubécourt
Erize la Petite
Sommeille
Rembercourt
Laheycourt
Villotte
Nettoncourt
Charmont
IV. A.C.
II. B.A.C.
Brabant le Roi
Laimont
V. A.C.
W.D.
I. B.A.C.
Bar le Duc
XI. A.C.
Railway
Position of Troops on 26.8.70.
Scale; 1:400000.
5
0
5
10
15
20
25 km.

each corps to be followed by its own transport, and the road Belval—Passavant—les Islettes—Varennes would have been left free for the deployment of the right wing of the Third Army which would have been of great advantage to it. I have dealt here somewhat in detail with this example from military history to show that in matters of operations of this kind it is not a question of mere theory, but of movements which might actually occur in war.

SKETCH 12.

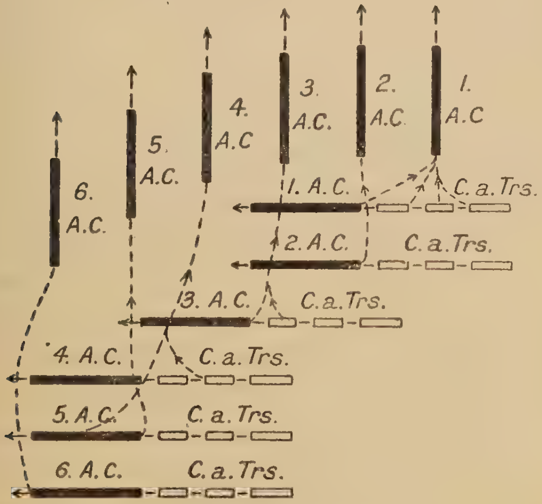


If a similar movement is to be executed by five corps, the *two* inner corps must retrace their steps one and two days' marches respectively to obtain the same result. The trains and columns of the two inner corps must also close up on their rear to clear the road for the two army corps. The lines of communication retain the position they have to each other. Communication by them can therefore be easily regulated for the advance in the new direction. If the army consists of six corps, the three inner corps must move backwards on the same principle. With still more army corps, the marches forward and backward must be combined according to special circumstances. But it is hardly likely that there will be armies consisting of more than six army corps.

The term "day's march" as a determinant for the requisite return marches must of course not be taken schematically or literally. The distances to be covered towards the rear by the inner corps would, in reality, depend on the distances of the roads running parallel with each other, and to be used in the new direction. But *the time* needed for reforming the new front is calculated by the breadth of the front the army was occupying in the direction of the original advance. As many days' marches as this breadth consists of, as many days will the whole movement last, plus the days the outer corps must march before it can wheel with its head into the new direction, unless we wish to increase the march performances of all the outer corps.

It is obvious that the danger inherent in the whole movement lies in the fact, that, with an army of more than three army corps, some of the inner corps must perform return marches, which are rather in the nature of flank marches if the enemy is expected from the new direction, and that the inner corps are altogether for some time exposed to being attacked in detail. This danger is a matter of course, and can never be completely avoided. Yet the crisis may be materially shortened and lessened if—as always when wheeling—we echelon the inner corps one or two days' marches towards the rear the moment the chances of a change of front have to be considered. In that case the corps forming the echelons can at once occupy the new front by turning with their heads into the new direction, thus covering quickly the movement to be carried out by the corps of the outer flank. If the inner flank is not to be held back by echelons of two or more days' marches, proportionately more corps of the outer flank must carry out the wheel, the movement lasting accordingly a longer time.

SKETCH. 13.

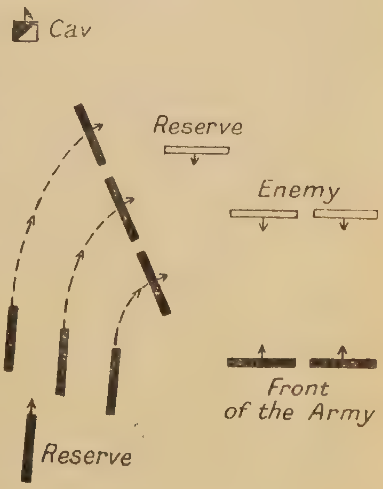


It is true some soldiers reject strategic movements to the rear, as a matter of principle. Field-Marshal Moltke also held the opinion that movements of this kind are to be avoided. I myself have repeatedly heard authorities supporting the opinion that, owing to the nervousness of modern troops and their inferior steadiness as compared with what it formerly was, retrograde movements must, as much as possible, if not positively altogether, be avoided. so as not to shake the morale of the troops. But I think that such an opinion, is, on the one hand erroneous, and, on the other, extremely dangerous.

German troops, having trust in their leaders, will never be demoralized, I believe, by a voluntary retrograde movement, if the reasons for it are clearly set forth, or if the troops have already learned in peace that certain strategic operations can only be rapidly and safely executed by retreating. Such an opinion is, however, dangerous in many respects. First of all it cramps the freedom of operations in a manner not sufficiently justified. Next, the following has to be considered: If the troops are pervaded by an idea that retreating in the face of an enemy must be avoided at all cost, we may easily find ourselves in situations where we must accept battle under unfavourable conditions, merely because we believe we are not allowed to avoid it by retreating. Weissenburg, Spicheren, and Wörth are an answer to such opinions. But the other and greater danger is that in war there are necessary and enforced retreats that cannot be avoided at all. Now, if commanders already fight shy of voluntary retreats as dangerous to the steadiness of their troops, how can they ask those very same troops to remain steady, disciplined, and valorous in retreat after a lost battle? An army efficient for active service must be able to advance and retreat whenever required by circumstances, without losing its tactical worth, and an army can always do this if systematically trained in peace with this idea.

When, after the Battle of Orléans, the left of the French army gave way down the River Loire, it succeeded in facing about again between that river and the Marchenoir Forest, opposing in this new position the attacking Germans by a most determined and lasting resistance. And these Frenchmen were only rapidly organized militia troops. The highest credit therefore is due to General Chanzy for all time for the way in which he managed to imbue these young and loosely organized soldiers, in spite of the lost battle and difficult winterly retreat, with a spirit that showed to such advantage in the combats that followed. We thus see here what can be done, if the will is there to do it. And do you mean to say that German troops cannot do it?

SKETCH. 14.

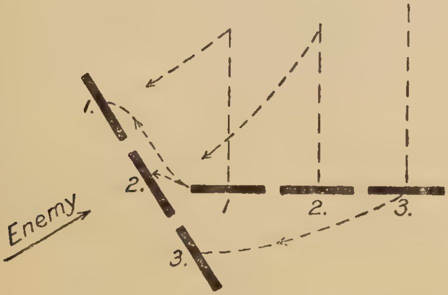


Of course, it is necessary in all retreats to adhere strictly to systematic movements and to look after regular supplies, so that the troops may not suffer want, and be obliged to live on the country through requisitioning, which in retreat is too apt to demoralize and injure discipline.

Wheeling the wing of an army backwards brings about a defensive flank as we can study in the example afforded by the Battle of Mukden; envelopment, on the other hand, must be carried out, as a rule, by a wheel forward. Circumstances must be exceptionally favourable for making it possible to gain the enemy's flank by advancing upon it without a previous change in the original direction of the march. The attack upon the flank must be developed as a rule after a frontal advance, and can be initiated in echelons by the outer corps moving forward at an accelerated pace, followed by the other corps echeloned towards the rear so as to establish ultimately the front against the enemy's flank by a wheel of the heads of the corps. An orthodox example of this method of moving is the advance of Nogi's army for enveloping the Russian right in the Battle of Mukden. The first division in advance ; then echeloned to the right rear : first the seventh division, and then the ninth ; in second line a Kobi brigade ; in this way the army advanced, and then wheeled around towards Mukden with the left forward. During the advance the first cavalry brigade, being pushed far ahead, guarded the outer flank of the army by ascertaining early any concentration of Russian troops that might become dangerous to the head of the army, and afterwards to its flank. The same protective measure will be urgently needed in all similar cases in future, for it is scarcely possible that we shall ever meet again opponents with such poor ideas as evinced by Kuropatkin and his subordinate commanders. On the contrary, we must expect that every attempt at enveloping will be met by suitable counter measures, and we must account for these in our operations if we hope to be finally successful in battle.

It is certainly not always easy to adopt the necessary defensive measures. If the envelopment takes the form of a complete flank attack, obliging the army attacked to change front after having deployed already for a defensive battle, considerable difficulties will arise in arranging marches, the difficulties becoming all the greater the more the movements have to be carried out under the pressure of an imminent hostile attack. It will mostly be a case of deploying according to circumstances towards one or two sides. If the distance of the enemy allows us to occupy the new front by making a flank march with some portions and only forming up with others, the position of the lines of communication to each other can remain the same, and the thing is comparatively

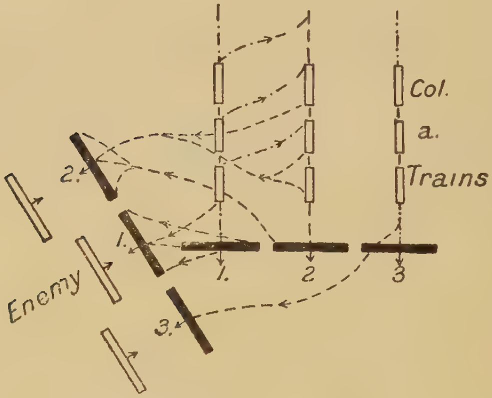
SKETCH. 15.



simple (Sketch 15). But it the outer corps has to deploy at once towards the enemy, and if the others have to form up next to it, the position of the corps to each other changes, their lines of communication must cross each other, and to all the corps, or to some of them, must be assigned different lines of communication (Sketches 16 and 17). Under such circumstances it is scarcely possible to avoid crossings and irregularities, and this makes it extremely difficult to subsist the troops systematically and regularly. The same holds good for any deployment where the position of the corps to each other changes.

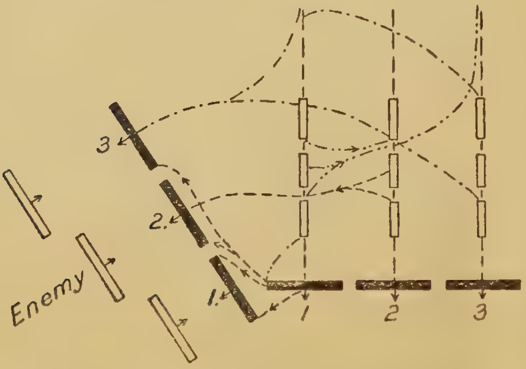
Flanking operations, wheels, and deployments of large masses are not only rendered difficult on account of the lines of communication of the various army units, of the long train of supply columns and depots

SKETCH. 16



leading to railheads, which the individual corps have to drag *after them*, and which sometimes have to be

SKETCH 17.



transferred to other roads and connected with other railways, but they are so, also, owing to the reconnoitring and protective bodies which have been pushed towards the enemy *beyond* the heads of the main columns.

These bodies spread towards the enemy a net of close meshes in the shape of patrols, connected with the main bodies of the army behind by telegraph lines, relays, reporting centres, army signalling, and wireless telegraph stations. This whole apparatus must be apprised of every change in the direction of advance as well as of every change in the position of the corps to each other, and must be directed on to new roads without completely interrupting observation in the present direction before other organs have taken charge of it. Orders must, therefore, be issued with special care, lest the object might fail, and this requires much time. In spite of all adjuncts of modern technics, it will take a long time before such an order can reach all advanced bodies. The mechanical aids work sometimes admirably when used for reporting from front to rear, but naturally fail to do so with all detachments in closest touch with the enemy. The difficulties to be overcome here are enhanced under present conditions by the way in which modern reconnaissance is organized in depth, which in turn is again a consequence of the enormous size of the armies.* We see, therefore, that all strategic movements require a certain amount of preparation in this direction, too, before they can be executed. In rear and in front most complicated arrangements must be made.

From these considerations it follows that all strategic movements of large masses entail extraordinary difficulties, caused merely by the geometrical lie of the lines of operation, by the lines of communication, and by the advanced detachments, and that even under normal conditions these movements can only be carried out rapidly and in an orderly manner if headquarters arrange everything with the greatest care, exactitude, and system, and if subordinate commanders intelligently fall in with the leading idea. Yet these difficulties grow still more, owing to the special circumstances created by the different nature of the theatres of war, and which are decisive in all warfare; and this weighs all the more heavily when it is a question of moving the masses of modern armies.

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* Vol. I., Book II., Chapter I., p. 69.

The insufficiency and deficiency of the roads and railways alone aggravate matters extraordinarily. The wider the meshes of the road net, the more difficult become movements and subsistence when we are closely concentrated; the worse the roads are, the less we can use motors on them; the fewer the railways which connect the army with its base, the shorter will become the marches, the more cumbersome will be the transport service, the less will the army be able to operate, and the simpler will in consequence be the forms in which attack and defence are carried out. The topography of the country, the density of its population, and the richness or paucity of its resources, also assert themselves in a similar manner. The nature of the theatre of war must, therefore, be closely considered in all plans of operation. The whole transport service must, for instance, from considerations of this kind, be altogether differently organized for an offensive war into Russia and for one into France.

In addition to the kind and nature of the roads and railways, the effect of the country is of special importance. Its influence seems greater than formerly through the conditions of modern warfare. Passing obstacles, like mountains, marshes and rivers, with large armies, is infinitely more difficult than with smaller forces.*

If from a well-developed network of roads, which permits us to advance with numerous columns on a broad front, we have to file into a few roads by which alone we can cross the obstacle in question with the object of unfolding again on a broad front on the other side, it is always an extremely difficult and, as a rule, a very dangerous operation in the face of an enemy. In the case of rivers we can manage sometimes with numerous bridges freshly constructed, though the carriage of the requisite bridging material may cause considerable difficulties. But in the case of mountains and extensive swamps, the creation of new passages suitable for military use beyond the number of those existing, is, as a rule, altogether impossible.

The difficulty consists in the various army corps having to pass the same portion of the road in succession. If each corps is followed directly by its supply columns, the fighting power beyond the defile is but very gradually raised, which may become dangerous in the face of an enterprising enemy. If, on the other hand, we march the fighting troops in succession, and afterwards bring up the trains and columns, the troops must for the time being live on the country, which will be rarely possible, and fall back in case of need on their iron rations, which they will then miss in the operations afterwards. There are grave objections to this course, too. The supply of bread will, above all, cause great difficulties as well. If actions are anticipated directly after crossing, the troops will also need a portion of their ammunition columns. These are even then of particular importance.

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* *Vide* General Freiherr v. Falkenhausen, "Flankenbewegung und Massenheer." Advance and retreat of a French army across the Rhine are there clearly and strikingly described.

Under such circumstances it is impossible to indicate a uniform method by which the various difficulties of this kind of operation may be overcome. The circumstances of each case must decide how much of the supply and ammunition columns must be apportioned to the troops at once. But every possible means must be made use of for accelerating the movement. We must first of all march day and night without a break, and with broader columns if possible without superfluous distances between them. According to the conditions of the country beyond, and according to the time calculated for the whole operation to last, we shall furnish the troops with the necessary reserves of provisions, and at the same time move forward the depots as close to the entrance of the defile as possible, so as to accelerate the refilling of the empty supply columns afterwards. We shall do likewise with the ammunition reserves. If feasible, the cavalry will be pushed beyond the defile to reconnoitre the enemy, and to collect at preconcerted points supplies for the troops that follow. Field bakeries may also be sent ahead covered by the cavalry, if the distance of the enemy permits this. The army corps first to cross must clear the outlet of the defile, and advance as far forward as possible, so as to secure the necessary space for those debouching behind them. If they are threatened by an attack of superior numbers, they must entrench themselves bridge-head fashion, offering a most determined resistance. In this way we shall succeed in crossing the obstacle and unfolding the army again beyond it, unless the conditions are altogether unfavourable.

But obstacles of this kind will always permanently impair the freedom of an army to operate; for although the troops can move freely again beyond the obstacle, yet the lines of communication are confined to the existing passages, and the unfortunate case arises where the lines of communication of various march columns can no longer run parallel with each other, but must converge towards the defiles. This causes all transport to make wide detours, limits the march performances of the troops, and renders traffic in the defile itself difficult.

This unfavourable relation of the roads to the number of march columns is bound to assert itself most particularly when a retreat is involved. The difficulty increases with the number and size of the columns which have to use the same defile. Only a most determined resistance in the face of an enemy pushing behind can in such a case ensure the necessary time for the withdrawal, and save the army from a catastrophe. This resistance must be offered as far away as possible from the mouth of the defile. Efforts will be made in such a case to push all transport first through the defile; yet we must not be afraid of sacrificing a portion of it, if by such sacrifice we can withdraw the troops themselves safely from the enemy. This will be first of all the fate of the ammunition and supply columns, which must remain with the rearguards, so as to allow them to continue in their resistance. The movement must be accelerated by all possible means, and more so than during an advance; and care must be taken to preserve the strictest order in crossing the defile itself. Beyond it, unfolding must be expedited, the army re-established with all energy, and the enemy vigorously prevented from pushing after us.

Fortresses in the enemy's country have an influence similar to obstacles of the ground, as the intervals between them form artificial defiles, which may impair to an extraordinary degree the freedom of strategic movements, especially if they block railways at the same time, and thus prevent the use of the indispensable arteries for the supply of the large armies.

To lead an army systematically forward to decisive battle is a tremendous task, merely from a material point of view. The battle is the climax of the operations conducted by General and Army Headquarters. Other factors have then their say in the battle itself; these will not be discussed here. But after the battle operations are resumed according to the issue, by either arranging for pursuit or for retreat, which causes the army to spread out again.

Let us first of all deal with the pursuit, which so rarely performs what theory prescribes, and, as a matter of fact, must prescribe.

The reason why pursuit so often fails is very natural. It always generates only from a successful assault; for a purely passive defence, even if successful, does not bring about conditions necessitating pursuit, and making it in the real sense possible, because it is but very rarely that the defence will inflict an actual defeat on the assailant. We can therefore confine ourselves to considering only the successful assailant. In this case, it is first of all the exhaustion of the victorious troops, the relaxation following every great exertion, which prevents us as a rule from vigorously following the enemy. The troops of the assailant, at the end of the battle, have generally passed through a very much harder time than those of the defender, namely, the marches to the battlefield, and the carrying through of the tactical attack on the enemy who is awaiting it in position. The moral tension in the attack is usually greater, too, than in the defence, because the losses are also greater as a rule. If victory has been gained, this tension relaxes, and is followed by a reaction which is only too natural. This slackening of energy, resulting from physical and moral weariness, is difficult to combat if there is no outward compulsion to overcome it. But in addition to these conditions, there is another more palpable circumstance hampering pursuit. During battle all measures are adopted to gain a victory, but the preparation of pursuit is generally not thought of. Pursuit, however, in a strategic sense, under the conditions as brought about by the numbers and areas concerned in modern war, can only become effective directly after battle if it is prepared tactically and strategically beforehand.

Pursuit is carried out in a twofold manner as explained in another chapter*—namely, pushing frontally after the beaten and retiring enemy, or following him and enveloping both his flanks by roads parallel to his line of retreat.

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* Vol. I., book II., chapter v., pp. 205, etc.

Pursuit in front will generally come to a standstill not long afterwards, owing to the exhaustion of the troops, the setting in of darkness, and the resistance the enemy's reserves and rearguards will, as a rule, be able to offer still on ground favourable for defence. The necessity of supplying the troops will also soon assert itself. Yet there may, of course, be cases when, as at Waterloo, frontal pursuit must be carried out with the utmost vigour. The state of the beaten enemy will decide that.

Generally, more important and more successful is pursuit by parallel roads. But it must be prepared at an early stage. During the battle itself our thoughts must turn to pursuit as soon as the issue seems no longer doubtful; troops must be moved forward around the enemy's flanks against his lines of retreat to break forth thence even during night and push on as far as possible the moment the enemy starts retreating. If this is done, then, and only then, can we count upon actual results in pursuit.

In this spirit we shall first of all use cavalry and cyclists, but infantry must follow them under any circumstances to break down every possible resistance and enhance the moral effect of pursuit. For this we shall use the freshest troops if possible, exacting from them the utmost of their marching power. It is important to provision them on the battlefield itself before they start. For this purpose the supply and forage waggons must be moved up to the battlefield if feasible, and the travelling field kitchens with their contents must be attached to the troops, because during pursuit these troops will have to make long marches and cannot, therefore, count upon being supplied at first. And so they will as a rule have to fall back on their emergency rations, and on the supplies captured from the enemy. But the cavalry must under any circumstances be accompanied by forage waggons. They must be brought up to the battlefield in time.

Pursuit depends, therefore, on a whole series of preparatory measures on which usually no thought is bestowed under the impressions and cares of battle. An officer of Headquarters must be specially charged with initiating these measures in ample time. They are of the utmost importance, for an ample pursuit alone completes victory and may save us further battle.

While pursuit is progressing it becomes necessary as a rule to spread the army out again, so as to continue operations and regain the broader front needed for marching after concentration for battle. This will be consummated on the whole without difficulty, because we are no longer acting under the stress of strategic compulsion, but according to our own free-will. It is, above all, important to detail quickly the roads by which the various corps are to advance, and to place the trains and columns as early as possible on these roads, so that the lines of communication may be quickly reorganized and the advance not delayed by questions of supply. The outer corps, which usually have to march the longest way, must before all be put in motion early. To avoid crossings and collisions the roads must be detailed also for the lateral movements which some corps will have to execute, and this must be done not only for the fighting troops but for the trains and columns as well, so far as this is possible after taking note of the situation and grouping of the forces.

Everything must be done to get again quickly into motion. If ever possible, no rest-day must be allowed after battle. May the demands made upon the troops be ever so great, these demands must be complied with. Pushing straight behind the enemy with the whole army, and not with a few comparatively weak pursuing bodies only, will achieve great results in most cases ; while as a rule abating the pressure means building golden bridges for the enemy. It was merely owing to Prince Frederic Charles giving his troops some rest after the battle-days of Orléans and sending only weak bodies of cavalry in pursuit, that General Chanzy was able to face his army about again at the Forest of Marchenoir and to organize some further resistance. This relaxation of energy after victory cost the German army streams of blood, while immediate pursuit would probably have entailed a complete disbandment of the hostile army. Examples of this kind can be freely cited, but the reasons given for justifying this relaxation of energy are, like in the case quoted, not valid at all as a rule, and if they are so, nevertheless, then they are usually due to want of proper foresight. Pushing behind the enemy after battle with the mass of the army is a thing that must be prepared and initiated in time too.

Still more important during battle is a timely preparation for retreat, because here all action proceeds under the depressing influence of tactical defeat and under the pressure of the pursuing enemy. It is then a question of keeping a cool head at all cost and doing everything to regain strategic freedom of action.

There are not many actions and battles in which from the outset we can count upon victory for certain, and would have, therefore, no need for considering the necessity of retreat at all. The possibility of retreat we must generally always take into account, and we will have to make up our mind how we must proceed in case of need. We shall always, though as quietly as possible, adopt our measures for retreat, should it become necessary, to be executed in an orderly manner. To do this we must before all form a clear idea of how the roads are to be apportioned to the various bodies when retreat becomes necessary; where we wish to form rearguards, where the troops are to begin forming columns of route, and how far retreat must be continued without break, under any circumstances, to regain strategic freedom of action, which is lost so long as the enemy is close on our heels.

As soon as retreat becomes necessary, it will, as a rule, be best to keep any available reserves, or altogether those troops which are farthest away from the fighting line, in rallying positions, and to withdraw the troops in action through or around them. In that case we must from the outset provide against being pursued on parallel roads by sending our own cavalry, if still fit for action, forward with cyclists to meet the enemy (as I have already explained in another chapter*) and by pushing out beyond the flanks any reserves that may be still available, to serve in support of the cavalry and to block any roads.

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* Vol. I., Book II., Chapter V., pp. 210, 211.

If the rallying positions have been occupied, if under their cover the troops in action have disengaged themselves from the enemy, and if we are sure of delaying him for some time with our rearguards, columns of route can be formed beyond the reach of the enemy's fire. We shall, however, not form these columns at once to the full depth needed for further operations in retreat, but we shall retire at first through the country with numerous short and rapidly formed columns, so as to increase as quickly as possible the distance separating us from the enemy. Not till then shall we file into the prescribed roads.

In continuing retreat, it is of great importance also not to make the columns detailed to the various roads too deep. Long columns render marching altogether difficult, are apt to cause delays, oblige us to start early and go to rest late, and make all arrangements for supplying and billeting the troops during the night more difficult. When marching in great depth there is also likely to be more need for the rearguards to offer too protracted a resistance should the enemy be pressing closely after them.

When we were considering the difficulties of supply arising during retreat, it was shown that it is desirable not to rest for the night in the same depth in which the column was marching, but to close up for the night first and extend more in breadth, so that next morning all transport may quickly gain a start over the troops. If the rearguard is attacked while the troops are resting, its resistance must last the longer the more time it takes the column to get on the road and gain a certain amount of start. This evil could certainly be avoided if we rested in the same depth in which we have been marching; but as this would cause, as I said before, other very material disadvantages, it is best generally to close up for the night, and march in such a case with as many, and, therefore, as short columns as possible. The fact also that it is easier to assume the offensive at the first chance offered, and to hurl back with superior numbers the heads of the pursuing enemy, speaks in favour of proceeding in this way.

The conditions are particularly difficult when, after a lost battle and close concentration, a broader strategic front has to be re-established. An operation of this kind is greatly facilitated if the troops are accustomed to march for some distance across country. Filing long columns into the line of retreat in proximity of the enemy may then be avoided in many places. Yet it will always be very difficult during the initial phases of retreat to deploy the troops for regaining their strategic front towards the rear. All the more important is it to leave all transport during the battle far enough behind to prevent the retreating troops being impeded by it, and to group all the transport from the outset in such a way, that it can be moved up quickly after a successful battle on the one hand, and on the other that it can readily reach without difficulty the roads assigned to it for an eventual retreat. General and Army Headquarters must not be afraid of encroaching upon the jurisdiction of their subordinate commanders, and of giving them definite instructions, with the object of ensuring at all cost the proper execution of these movements, and of keeping, at any rate, control over them. Only a thoroughly clear-sighted and systematic procedure can diminish the dangers of a retreat, and it is all the more imperative the larger the numbers that are retreating, and the more we have to deal with loosely organized units, new formations and similar bodies, or with bodies severely shaken by tactical defeat. Chanzy's retreat from Orléans is very instructive too in this respect. The method and foresight of his arrangements no doubt materially contributed to keeping his army together. The troops found supplies and regular quarters on the line chosen for renewed resistance. If there is a chance of using existing railways for transporting the troops to the rear, we would take advantage of this, so as to relieve areas of concentration, which are particularly densely occupied.

But it will always be difficult to disengage ourselves from the enemy. It may cause the gravest losses if the enemy pushes on vigorously; it may lead to a catastrophe, if the enemy succeeds in crowding together the beaten army by enveloping it, and in preventing it from regaining its proper strategic front. In this—in an enforced concentric retreat—lies evidently the chief danger to-day, to which the defeated army is exposed, because it is the enormous size of the armies which makes it so much more difficult to subsist their numbers, to move, and to deploy them for battle within a limited area. The Russians felt it to their disadvantage at Mukden. Numerical strength as such may, under these circumstances, mean destruction ; and a commander-in-chief must do all in his power to avoid that danger.

We must, therefore, under any circumstances, ecure the necessary area of operation when retreating. When we can base ourselves in different directions, as will often be the case, especially in one's own country, it may sometimes be very advantageous to withdraw in diverging directions, thus attempting to secure also, in retreat, the exterior lines, and limiting the enemy's chances for deploying. Especially for such troops as were engaged in attempting to envelop the enemy's flank, and have changed front, an operation of this kind may be imperative and advantageous. The base of the diverging portions must then be transferred in time. Good service may be rendered here, above all, by mechanical transport. The lines of communication authorities must also be apprised in ample time if possible, so that they may be able to push the supplies for the troops early enough into the new direction.

Although pursuit or retreat are the usual after-events of battle issue, yet it may as well happen that the victor after battle keeps on the heels of the beaten enemy only with weak detachments, and withdraws with his main forces. This will occur, when, operating on the inner line, he is obliged to turn against a new enemy. We will deal with the nature of that operation in another chapter ; here we will discuss only the mode of carrying it out.

If victory has been achieved in the first direction, and a decision has been come to with regard to the troops that have to be moved into the new direction, it is above all important to deceive the enemy as long as possible about the further employment of our own main forces. We shall attain this best by making the troops left behind keep up all the appearances of a vigorous offensive, even though, in reality, this is past their strength, and by giving the enemy no breathing time. The operation must be carried through under cover of this deception.

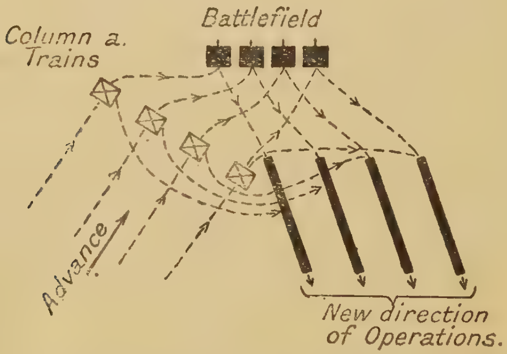
It will be first of all a question here whether the departure can or is to be made by rail, or whether the whole operation must be carried out by route-marching.

In the first case the troops must march as straight as they can to the entraining stations, moving their transport directly *behind* them. The departure must be carried out in a systematic manner, without undue haste, and in accordance with the principles laid down for railway transport of large numbers of troops. Before all, sufficient rolling-stock must be made available for rapidly entraining the troops without a break. It will be also expedient to embark at as many stations as possible, for which purpose such stations must be prepared. What undue precipitancy and want of system may lead to is exemplified in a striking manner by the transport of the French first Army of the Loire and of the 24th Army Corps from the neighbourhood of Bourget and Lyon to the country about Chagny and Besançon in the winter campaign of 1870-71. Detraining must be carried out far enough away from the enemy for the troops to begin operations unitedly, and with their lines of communication properly organized, and to have a sufficiently large area of operation in front of them so as to be able, if required, to bring about the requisite grouping for battle by route-marching, and for acting with united forces. Engaging the troops in driblets must be avoided if possible. The more lines of railway we can use the quicker and simpler will the operation proceed. Sometimes it may be advisable to rail the field bakeries as the first echelon of the corps, to provide for sufficient bread in the area of concentration; and, in fact, most ample preparations must be made for ensuring the army to be billeted, subsisted, and supplied with ammunition after detraining.

If the operation is to be executed by marching, it becomes a question of whether the individual corps are to go back by the same roads they previously advanced on, or whether they have to strike into a new direction. In the first case the matter is simple. The corps march back past their trains and columns, which halt during that time and then follow their corps in the order required by the new operation. The corps can get their provisions in passing the supply columns, which in their turn are refilled when passing the depots in rear. But if the corps are to march back by roads other than those upon which they advanced, it will be best first of all to establish depots early on the new lines of operation, from which the troops can draw provisions in passing and be subsisted in the operations afterwards; the columns and trains, on the other hand, must be moved by transverse roads to the new roads of advance in such a way as to reach, if possible, just the tail of the fighting troops they belong to. A uniform control of this movement seems to be imperative to complete it systematically and to avoid crossings. Considering the great length of the trains and columns it may sometimes facilitate the whole movement, if the whole transport first of all closes up, parks near the original roads of advance, and then moves to the new roads. In this way crossings and detours can be best avoided, as is apparent from the accompanying sketch (18).

It is seen there that crossings are avoided when the march is resumed simply because the columns and trains have formed up on the lines of advance. If it is possible to move the whole transport to the new lines of operation while the battle is still in progress, the whole movement will be simpler again from a technical point of view.

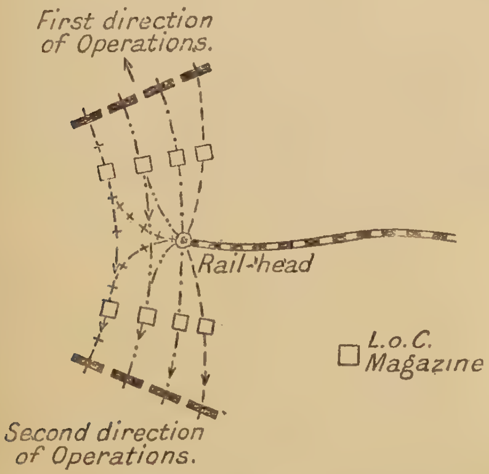
SKETCH. 18.



The arrangements for the departure after the battle are for the rest not at all restricted to the method indicated here. Any number of combinations are possible and may prove practical according to the number of corps involved in the operation, the situation of the lines of advance and departure, and the manner and order in which the corps march off. But it is always best to form a clear and systematic view on the course the movement is to take, else we run the risk of organizing disorder instead of order.

The position of the main depots, which, as a rule, are railheads, and of the advanced depots, will continually influence the execution of the whole operation. But it is exceedingly difficult, and altogether to a very limited extent only, possible to lay down definite

SKETCH. 19.

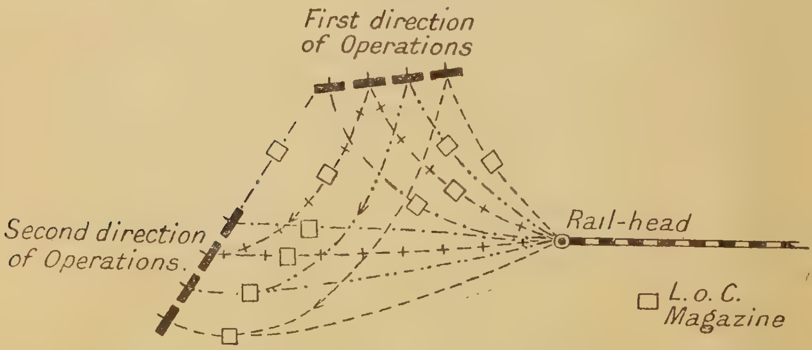

First direction of Operations.
Rail-head
L.o.C. Magazine
Second direction of Operations.

principles for the arrangements to be made for harmonizing the strategic movement with the traffic connecting the troops with the depots. All depends here on the number and position of the railheads with regard to the strength and direction of the front of the army. We shall be obliged to adapt a special system to the circumstances of each individual case.

If railheads and depots are situated *between* both fronts of operation so that in both directions of advance they are behind the army, the case is very simple. It is then expedient to form up on a level with the depots those columns and trains which, during the operations in the first direction, were between the troops and these depots, and to move the columns and trains thence behind the troops as soon as these, marching in the new direction, have passed the line of the depots with the tail of their columns. Military history furnishes many examples of this kind.

The arrangements become very much more difficult and will therefore, require far greater care and preparation if railheads and depots are not situated behind the front of the army, but aside of it, as may be caused by the strategic situation, and as happened, for instance, with Bourbaki when he was operating on the inner line between Villersexel and the Lisaine;* it is then difficult to avoid detours and columns crossing each other. In such cases we must always

SKETCH. 20.


First direction of Operations
Second direction of Operations.
Rail-head
L. o. C. Magazine

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* *Vide* Grosser Generalstab, Kriegsgeschichtliche Abteilung I., "Studien zur Kriegsgeschichte und Taktik," Erster Band, 4. Operationen im südöstlichen Frankreich.

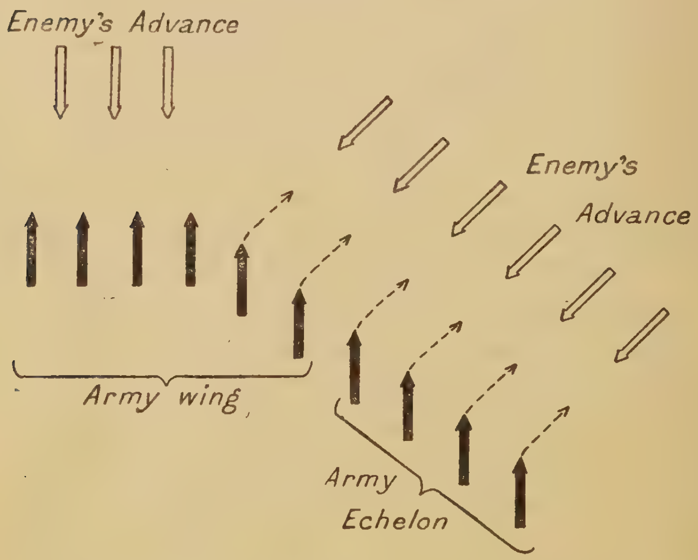
strive to prepare a new base in time for the new direction of operations. Even then the transition from the old into the new direction of advance will be still difficult, and this difficulty grows with the size of the armies operating. In situations like these, the orders of march must be issued by General Headquarters, and it must not be left to the individual subordinate commanders to arrange for the necessary measures from their own one-sided standpoint if disorder is to be avoided. This makes the issuing of orders more difficult; it is a difficulty which must not be underrated, because superior headquarters will have to deal with details, with which they are, as a rule, not currently occupied and which they have great difficulty in keeping themselves always exactly informed; but this difficulty must be overcome if we wish to maintain the order necessary for the efficiency of the army. Disregard of this demand, which must be made as a matter of principle, has led in numerous cases to the gravest consequences, as we can prove. It has likewise always met with punishment if in difficult situations it was thought unnecessary to adhere to a clear and systematic arrangement for the marches.

Of course, the roads actually existing, the country, and other circumstances of each case will rarely admit of the theoretically best method of operation and arrangement of the marches being put into ideal execution. If the roads are limited we will often be obliged to make use of the night for the movements; we must often accommodate ourselves by assigning different hours of starting to different units, by shortening the columns, and by marches across country. But such make-shifts always give renewed cause for frictions and inconveniences which can only be avoided or overcome by a proper method. Difficulties can never be altogether avoided. There is no such thing as a military account without a balance. *The* commander, who clearly bears in mind the consequences inherent in the nature of his arrangements, will alone be able to render to himself sufficient account of their practical bearing, so as not to be taken by surprise by their results, and to be equal to any occasion.

Our discussions hitherto have made it clear that under modern conditions the mechanism for moving the individual armies is in many ways a very complicated one, needing careful and deliberate adjustment to keep going and remain effective. All the more simple are the principles by which the various armies co-operate within the compass of the army as a whole. Retardation and acceleration of the strategic movements; separation and concentration for transferring the centre of gravity from one point on the whole front to another; wheels and flank marches for enveloping the enemy or warding off envelopment; moving up reserves into the front line of the army; and lastly, echeloning, are the few operations that can be ordered for attaining any intended co-operation. The technical difficulties to be overcome in this are chiefly confined to regulating the lines of communication. These, it is true, are dealt with in detail by the various Army and Corps Headquarters; but General Headquarters must fix the general points of view by which to act, apportion the railways and lines of communication, and in dealing with the home authorities cause the requisite means to be got ready and distributed according to the requirements of the general situation. The measures adopted by General Headquarters in respect to all this, are of the most decisive importance for the continuity of operations and the frictionless co-operation of the armies. These measures form the necessary basis for the detailed orders of the armies and their efficiency for operations.

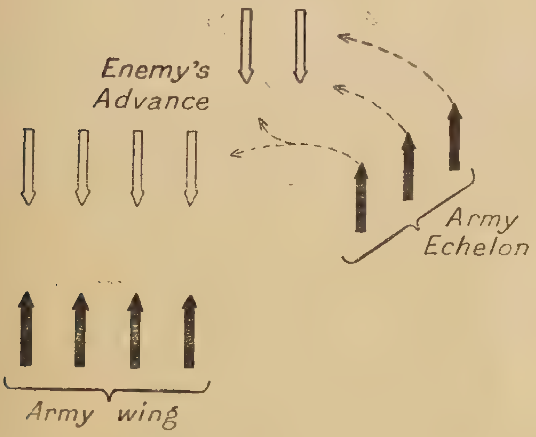
As regards the movements themselves we can only make sparing use of accelerating the marches. Our discussions hitherto have already made this clear. The retention of one army group will rather be more apt to attain the desired end. Separation and concentration will proceed in a simple manner in accordance with the principles ruling the movements of the individual armies. If this must be done while halting, flank marches of armies become necessary. Shifting reserves behind the front of the army will also have to be carried out by flank marches of this sort. It is the easiest way of re-establishing the original front by such marches. If reserves are to move from the rear into the front line, it will be an advantage to form a gap in it by contracting portions of the army; the new army group can then move into that gap. If this is not possible, command must be newly organized, when a reserve army pushes into the front, and the lines of communication must be newly organized and placed under uniform command, because the army marching up is moving on the lines of communication of the army in front, and the subsistence of the latter must not be interrupted. Wheels must be prepared within the individual armies by echeloning the portions concerned, if the circumstances allow us to anticipate such a necessity. If the whole army is to execute a strategic wheel, it becomes necessary to initiate it by echeloning the armies. By advancing *and* retiring various groups the operation can be accelerated. The co-operation of different armies is also best prepared by echeloning them, as can be seen in the accompanying sketches, which are meant to represent merely theoretical examples for instructional purposes. Sketch 21 shows how an envelopment is met by the echelon of an army which itself is echeloned; Sketch 22 shows an enveloping attack prepared by echeloning.

SKETCH. 21.



All things considered, echeloning will prove altogether one of the most important means of modern strategy. We shall be able to prove this convincingly when we deal with field operations in general, and this not only for echeloning to the rear but also for echeloning whole armies forward. Echelons to the rear can be easily established while advancing, and echelons forward when retreating, by stopping the portions which are to form the echelons, and starting them again after the necessary distance has been established. If during an advance one army is to be echeloned forward, the front of the other armies must either mark time, or special measures must be adopted for the army echelon to gain the necessary start. We then either move the outer echelons forward by rail when this is possible, or collect on the lines of advance of the echelon, under cover of masses of cavalry pushed far to the front, supplies in sufficient quantities to make the troops independent of their daily rations from the rear. In that case the march

SKETCH. 22.



performances can be increased to an extraordinary degree, and only the lines of communication authorities will have difficulty in following the movements rapidly enough with the railheads, depots, and ammunition reserves, to help when the supplies of the army, carried or collected, begin to fail.

CHAPTER VIII

SELF-RELIANCE, METHOD, AND COMMAND

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We have seen that the fire of modern arms forces us to give up all close formations in action, and to form loose skirmishing lines in the foremost fighting line, as loosely as the necessity of effective fire will permit. The fronts in action correspond with this looseness, and with the wider extension of the skirmishing lines caused by it. The same number of troops can to-day embrace a far greater space than formerly if a greater organization in depth is not insisted upon. The artillery is, owing to the distant fire of the enemy's artillery, obliged to use indirect fire. The cavalry has almost completely disappeared from the common battlefield of the other arms. With the enormous size of the army have also grown enormously the extent of the battlefields and the areas of operation. The vital points in the existence of armies, their organization, and the method of moving them, are altogether different from what they were formerly. All this causes an absolute change in the formal conditions of strategy and tactics.

But with the forms so also have changed the spiritual means which give life to these forms. The army and its leaders must of course be animated by boldness and initiative as much, and, perhaps, even more to-day than in the wars of the past, if we want to be successful. But the physical and moral qualities, by which this spirit must manifest itself, are, on the other hand, in many ways, different from those prevailing at the time of close formations. Especially must the influence of command be different from what it was formerly. In this regard no one has as yet arrived at a perfectly clear conception of what it should be, and in spite of completely altered conditions in actions and in operations, tendencies assert themselves over and over again, of working with means belonging to a past age. The latest wars show this in a striking manner.

It is, therefore, necessary to acquaint oneself thoroughly with the actual nature of modern war and combat, with the object of arriving at a perfectly clear conception of them.

Let us first of all present to our mind what a modern action demands from the two chief arms, and before all what the mode of action is which decides matters, namely, the attack, without which a victory can hardly be conceived. The infantry advances in widely-extended lines. The influence of commanders, as far as it is transmitted by orders, is small. Extension is too great, the noise of battle too loud, the tension of nerves too severe for the voice to be heard. Laboriously the most urgent directions are passed on along the line from man to man. At close and decisive ranges the example of the officers only prevails. But the enemy's projectiles reap a terrible harvest, particularly among the leaders, who are obliged to expose themselves most. All influence upon the men then fails, units become mixed, everybody is left to himself; the man as such becomes prominent, yet not the man who is *led* to victory, but the man who wants himself to conquer. Almost all the time he is in action he is left to himself. He himself must estimate the distances, he himself must judge the ground and use it, select his target and adjust his sights; he must know whither to advance; what point in the enemy's position he is to reach; with unswerving determination he by himself must strive to get there. Arrived in the enemy's position he must know what he is to do. If the attack is not progressing, if it is impossible to gain ground in the face of the enemy's fire, he must create cover for himself. If it comes to retreating, he must obstinately cling to the ground fighting.* Hardly ever can he count upon receiving directions from his superiors. But what holds good for the private, holds good all the more for the leaders of all grades. They cannot count upon receiving orders in the midst of fighting. It is as a rule impossible to send directions from the rear into the foremost fighting line. To count upon reliable communication by signs from the rear to the front is a fancy no serious soldier should entertain for one moment. Once the troops have come within effective ranges of the enemy's fire all regular and comprehensive issue of orders ceases. All success is entirely dependent on the clear-sighted action of individual groups and men, on the example of leaders, or of those who feel called upon to lead. This is what a modern infantry action looks like; *self-reliance is everything.* It was so, it is true, in the last wars, during the final stages of infantry combat, but in future the stage, where initiative is everything, will begin much sooner than formerly, and from the outset in a manner much more pronounced.

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* *Vide* v. Bernhardi, "Taktik und Ausbildung der Infanterie."

Artillery action will reveal similar features. So long as the batteries are under cover, are firing indirect, and are exposed only to sweeping and searching fire, regular control can certainly be exercised over large units. But when artillery has to unlimber in the open, and can be taken under fire, the effect of which the enemy can watch, not only the combined action of large units, but the issue of orders by battery commanders themselves will soon fail, or sometimes become altogether impossible. Sections and single guns will be obliged to fire independently, as often was the case in 1870–71; for the voice of the officer commanding the battery will not be heard, transmission by word of mouth will likewise become impossible in the din of battle, and soon numerous officers will have fallen. I am convinced we are deceiving ourselves if we believe a regular control of fire to be possible under these circumstances. The self-reliance of individual subordinate leaders and men, and not a uniform control, will be the decisive factor in the last instance.

These conditions are bound to exercise a far-reaching influence on the issue of orders. The troops can only act with self-reliance in a proper manner if they are thoroughly and sufficiently informed as to the intentions of the commander and the object of the fight. During the action itself any communication can reach the troops, especially the infantry, in exceptional cases only, namely, when for the time being they have reached some cover, where the commanders can, on the one hand, deal with the troops directly, and on the other receive orders themselves.

Under these circumstances the troops have to rely, as long as the action lasts, solely on what they knew about the object of the action and the co-operation of the various units *before* the battle began. This is overlooked too often.

To-day the mode of issuing orders in manœuvres is such that the troops often do not get a combined operation order at all. Special instructions are often given to commanders of units alone when charged with a definite task. The connection of this individual task with the whole plan of action is very often not apparent in these instructions. That commander then issues his orders in a similar manner. In this way everyone, of course, gets to know his special duty, but rarely how to co-operate with neighbouring bodies. Even if the superior authorities have issued an actual operation order, the effect is mostly the same. Only superior commanders become acquainted with it, issuing but parts of it as a rule to their subordinates. And so it happens that even brigadiers and colonels are often unable to get a clear view of the situation. Captains, to crown all, know nothing at all, as a rule, about the plan of battle, merely receiving for their companies some direction from the battalion commander, who habitually counts upon being able to send further orders to the troops during the action by his adjutant, because of real danger there is none in peace time. At the same time superior commanders are too frequently found in the foremost line, where they can survey all, and adopt suitable measures, without realizing that all this is impossible in real action.

We must break with this system altogether. A new method of issuing orders must take its place, if we do not wish command to fail on active service; for what we have practised in peace will be done habitually in war, however impracticable it may be.

In order to prevent the self-reliance of the various groups and men leading to confusion during battle, and that they may act in accordance with the intentions of Headquarters, it is imperative to adhere rigorously to a systematic issue of orders *before* entering battle. Everybody must know so much of the general situation as is requisite for him to know within the sphere of his command to enable him to act with self-reliance under any circumstances, even should the conditions be found to differ from what the order presumed, or change in the course of action.

He only, who knows the plan of the whole, is able to act suitably in sudden emergencies. There will certainly be cases when there is no time to proceed systematically, and when the situation calls for prompt and instantaneous action ; but the conditions of modern war generally require and allow orders to be issued in detail and systematically, because the attack must begin far away from the enemy, and the reserves must as a rule be held back far in rear. Prompt action, too, as occasion may demand, which precludes us from issuing detailed and special orders, can take the most correct and suitable form only if based on the general situation previously made known. The successful attacks in future will materially depend on the first measures adopted and on the method of issuing orders. General Headquarters must, therefore, always issue a clear and comprehensive operation order distinctly showing the object of the battle, the general plan, and the co-operation of the various parts ; and this order must not be communicated to the superior commanders alone ; everybody must know its essential portions.

The same principles hold good for the defence, except that here all is naturally less difficult. In a deliberate defence there will surely always be time enough for regular and detailed orders to be issued ; and also during the battle itself, especially when the fighting troops are lying under cover, it will often be possible for orders to reach them.

It is necessary, also, to issue to the artillery orders which will enable and permit every body to act with self-reliance. It is not at all enough to indicate to the various artillery brigades and batteries their positions and targets. *Far more important* is it for all to be informed on the *tactical object* of the fire. The artillery must know the task given to the infantry in the battle, and must be in a position to judge fully how it can best aid the infantry in solving its task, so that all subordinates, knowing the situation, are perfectly free to act with self-reliance at the given moment.

Acting with self-reliance in the sense and spirit of General Headquarters and of the uniform plan of battle known to us, is the decisive factor in modern battle.

Matters are somewhat different with cavalry. If it is used dismounted, it must, of course, be systematically furnished with orders like any other troops; nay, even more so, as there is the additional care for the led horses, which the commander concerned can only station correctly if acquainted with the general situation and the plan of action. But in real mounted action detailed orders are wellnigh impossible. Everything is enacted in rapid succession, at a rapid pace, in the shortest possible time, and only by a brief order and word of command can the will of the leader produce action. Sometimes the trumpet may also help to intervene. But it is possible to issue orders here in this way, because behind the commander are his troops to-day, as formerly, *in close formation*, able to hear his voice and trained to act with regularity on the briefest call or hint.

If the individual is, therefore, tied here to the mass, all the more prominent becomes the initiative and self-reliance of the superior leaders. They must always be fully acquainted with the strategic situation from which the action develops; the general and guiding plan of action must be briefly communicated to them. They must have learnt to understand from a few tersely coined words the idea and the will of the supreme commander. They must, however, not receive this will in the form of an order, but as a task, leaving them full liberty in the choice of the means for its execution. The supreme commander cannot know how the subordinate commander will find the situation, he cannot discount the enemy's counter-measures in advance, and must, therefore, leave to his subordinate all the more perfect freedom of action, as there will never be time for asking questions and giving subsequent directions during the rapid course of a cavalry action.

If independence of action in *cavalry combats* is thus generally restricted to superior commanders, and down to squadron commanders only when they are charged with a special duty, the necessity of independent action of even the smallest group becomes all the more prominent when the main duties of cavalry are involved—namely, reconnoitring, screening, and raids on the enemy's lines of communication. Reconnoitring squadrons, patrols, and other detached bodies, cannot be given stringent orders, but only tasks, which they must try to solve with self-reliance, in the spirit of a situation about which they have been informed. They will often find the situation different from what the superior was able to tell them; it will often change in the course of events. Over and over again will the individual be called upon to show judgment and determination. A strict method and the greatest self-reliance must go hand in hand here to enable everyone to respond to this call.

Reconnoitring, screening, and reporting must be arranged *systematically;* the system must be clearly expressed in the detailed instructions given to the members concerned, to enable them to understand the connection of these three duties; this system must become a second nature to all the troops so that everyone can find his way about in it. Every individual member, on the other hand, must be trained in *self-reliance* and be left to exercise it, so that when the situation changes and the enemy's action is felt everyone is able to act suitably in the spirit of the whole. The cavalry soldier must, more than any other individual of the army, rely upon himself when on strategic service, and upon his own judgment as well as upon his boldness. The amount of his self-reliance is at the same time the measure of his work.

The same reciprocal effect between system and self-reliance as required by the combat and strategic service of cavalry must, under modern conditions, be also demanded from the conduct of operations and the action of the various units during the operations. All movements of masses must be carried out systematically, if maximum performances are to be attained. In arranging the marches and regulating supply it is absolutely necessary, as we have seen, to be strictly systematic, so as to prevent most serious checks in the movements of the whole army. Its mobility directly depends on this system being adhered to, and commanders of troops must fully master its laws to be able to fulfil their duties. Yet the system alone is not enough for the proper execution of the strategic movements.

Two factors appear as a disturbing element: firstly, friction, which asserts itself in all actions in war, is caused by misunderstandings, unforeseen accidents, personal failings, and similar reasons, and will always exercise anew a paralyzing influence on the mechanism; and, secondly, the intervention of the enemy. When one or the other of these disturbances in the systematic course of a military operation occur, it is bound to have an effect all the more injurious, the greater the tension under which the whole and necessary system was working. In such a case there is only one means of keeping the entire mechanism going, namely, the self-reliant action of every link in the chain of this system, in taking care that the wants of the movement are first of all met by increased march performances of some portions and other suitable measures, and that next the disorder in the whole mechanism is again removed.

But such self-reliant action is only possible when all individual members are informed on the general situation. Here again, therefore, arises the necessity for a systematic issue of orders, which, without restricting individual action more than is necessary, must transmit enough of the knowledge on the general situation and the strategic object to enable the various portions in case of need to act with self-reliance in the proper manner. The modern means of communication and intelligence certainly facilitate in all such cases the co-operation of every part, but for all that do not replace self-reliance.

The way in which the English conducted the South

African War is, in this respect, extremely instructive. Here a system of perfect centralization of command prevailed. Every strategic and tactical movement was prescribed by the central authority to the minutest detail; personal initiative was confined to the narrowest limits. When it appeared it was at once suppressed, and where initiative proved necessary it failed nearly always. Especially when Lord Kitchener became Commander-in-Chief, centralization of command appeared in its acutest form, giving altogether rise to stereotyped measures. The result matched the action. As little as they ever succeeded in beating the Boers decisively in the first part of the campaign, as little did they succeed in suppressing the guerillas in the second part. The self-reliant initiative of a de Wet, a de la Rey, and a Botha defied all the thumb-rule measures of British General Headquarters, which positively precluded all independent action of subordinate commanders. The English must confess, and they do confess, that their army completely failed in this respect.* Complaints on the purely literal obedience and want of self-reliance and initiative of the English generals were heard from all sides. They characterize the opinion the English had of their own army. It had apparently ceased to appreciate that self-reliance is everywhere the necessary corollary to any systematic action.

The larger the portions of an army are with which we have to deal, the more independence must be granted to them, because General Headquarters cannot survey the details so well with large bodies of troops as they can with smaller ones.

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* *The Times,* "History of the War in South Africa."

A divisional commander knows exactly where each of the units belonging to his command is at the moment; a general commanding an army corps knows exactly the area occupied by his divisions, and the positions of the supply depots apportioned to him, and, if his corps is marching by one road, the whole apparatus of his lines of communication. The commander of an army on the other hand, is not informed on the interior arrangements made by the army corps. He only deals with army corps and the lines of communication; it is the business of the corps to arrange in detail the intercourse with the latter. The Commander-in-Chief finally deals with the area of operation and the objectives of the various armies, with the railheads and intercommunication in general. It is impossible for him to survey the detailed arrangements of the armies, still less of the army corps.

The larger the command of a general, the less, therefore, must he interfere with the details of the arrangements for which his subordinate commanders are responsible: for orders emanating from General Headquarters and interfering in matters of which the authority issuing the order cannot know the details, generally prove infeasible or cause, to say the least, grave inconveniences; these grow with the size of the operating masses, because with them frictions and possible misunderstandings increase.

This caused Field-Marshal Moltke to issue no further orders at all to the armies or independent army portions, but to send them only directives. The object to be attained was communicated to the army commanders, and they were given certain points of view on which they were to act. Where their spheres of action came in contact with each other, a dividing line was indicated, or one portion was placed under the command of the other. But the mode of executing their task was, as a rule, left to the subordinate commanders, and only occasionally did the Field-Marshal intervene by giving definite instructions on how to act.

The experiences gained with this system were not always satisfactory. Repeatedly it became apparent that army commanders were unable to grasp the spirit of Moltke's brief directives, because they were not conversant with Moltke's train of thought. Collisions and strategic difficulties were the consequence. I need only mention the advance of the First and Second Armies to the Saar, and the operations against MacMahon ending at Sedan. In both cases the mode of issuing orders did not suffice to bring about regular systematic movements. Too much independence was left to the subordinate commanders; they did not enter into the spirit of Moltke's orders, and the technical difficulties of the operations ordered were neither recognized nor overcome. In future we shall be obliged to develop Moltke's system further.

Directives of a general nature, like those given at that time, would not always suffice to-day for the co-operation of several armies.* We shall often have to adopt more detailed and definite measures for guaranteeing uniform action in the enormous mechanism of modern armies and for preventing the various bodies from disturbing each other. The numbers are now greater than before in proportion to the space available. This often causes the various portions of the whole army to be in close touch with each other, thus necessitating some definite instructions to be given. Yet we must again guard against going too far in this direction. Only what is absolutely necessary must be ordered. The greatest possible independence of the various portions must always be preserved. It needs much training of the mind, great tact, and a perfect mastery of the technical elements of warfare to find the proper limits between what must be ordered and what must not be ordered. The personal character of the subordinate must also be considered. To one may be left more freedom, the other we must tie by more definite orders. The psychological moment plays here a great rôle. At any rate, operations of modern armies must never be ordered which can only succeed if everything is arranged to the minutest detail by General Headquarters, and, as a matter of fact, can be so carried out. There is then still always the danger of invincible friction being produced.

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* The directives given also by General Freiherr v. Falkenhausen in his book "Flankenbewegungen und Massenheer" are not sufficient I think. The areas of operation of the various armies are not clearly defined it seems, and the system of reconnaissance and subsistence not definitely regulated.

When practising in peace, on the manœuvre field as well as on the map, we are always tempted to limit the independence of subordinates in the interest of our own intentions and views, many succumbing to this temptation. I have repeatedly had this experience. At war games, when dealing with strategy, General Headquarters ordered operations which could only be executed if the marches were systematically arranged in the minutest detail by

General Headquarters down to the army corps and their trains. The necessary orders were despatched in long telegrams to the various army corps. It was quite arbitrarily assumed here that the troops lived entirely on the country and were followed by regularly formed echelons of their columns and trains. The connection with the depots and railheads was not considered at all, else the whole arrangement would have been recognized as impossible in theory alone. These assumptions were unnatural; the writing and transmission of the orders were impossible as regards time. The whole procedure would have failed on active service for the most part in the issue of orders alone. In other cases the lines of communication system would have broken down. And if we now imagine such a procedure taking place, let us say, in the thinly-populated fields of Russia, we shall be able to realize all the danger of conceiving war based on arrangements of this sort. Paper can stand a lot of things, but in reality we pay for such follies with lost battles and ruined armies. The temptation to issue such orders for ensuring the co-operation of various bodies during intricate operations has often asserted itself in war, too. In South Africa, as I have mentioned before, English General Headquarters completely succumbed to it. During the so-called "drives," for instance, a similar mode was adopted. Everything was ordered by General Headquarters to the smallest detail, even regarding supply columns and their movements. Here only small detachments were certainly involved, scattered over a wide space, and an enemy consisting as a rule of some few hundred undisciplined Boers. Yet the system failed.

Because of the necessity of adhering to the system ordered, the enemy was of less concern, and the Boers remained masters of the situation.*

If, by ordering too much, we sometimes produce the opposite of order and co-operation, and therefore thoroughly fail in our object, we must never, on the other hand, out of regard to the self-reliance of subordinates, be afraid of ordering plainly and distinctly what is really necessary. Moreover, no subordinate leader must be left in the dark as to what is to be done. But this "*what is to be done*" must always keep within the limits of what can be carried out practically without the shadow of a doubt, and must never be determined by what is merely desirable.

A study of the Russian War in Manchuria is highly instructive in this respect. There was no end of orders. Every commander encroached upon the sphere of his subordinates, often ordering details with which he had nothing to do. But the troops were never clearly and distinctly told what they *were* to do. Superior commanders hardly ever expressed their will in unambiguous terms. Everybody shirked responsibility. It was never plain whether the desirable was really to be attained by all means. A firm resolution was never apparent. By this mode of issuing orders the firm will to conquer was ultimately drowned.

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* These "drives" were arranged in regular shooting fashion. The tract of country to be driven over for Boers lay, as a rule, between two blockhouse lines approximately parallel with each other. At one of the open ends troops were posted like sportsmen, as it were, towards whom a line of beaters drove the Boers from the other open end. During night the beaters bivouacked in small groups of about six men.

All the large detachments of the Boers of course broke through, partly on the flanks, and partly through the line of beaters, and then marched wherever they liked. Only stragglers were caught, at the expense of an enormous amount of force, of money, and of Kitchener spirit.

Command in modern war demands the greatest amount of tact, wise self-restraint, and rigorous clearness. The problem of command is not only to move the troops and concentrate them for action; its task is the wider one of causing self-reliant action of the spiritual forces of the army and its leaders, and of producing, as if by magic, the maximum performances, and of carrying away the whole to perform the greatest deeds by concentrating all self-reliance and all mental and moral forces upon the attainment of the object indicated by the Commander-in-Chief.

It is a delusion to believe this to be possible without staking one's full personality, and yet we see a modern tendency trying to limit the very personal element in command.

In an essay of the "German Review," called "The War of our Days,"* is described in a specially striking manner—certainly more humorously than professionally—the kind of command people often prefer to call "modern" to-day: "The Commander-in-Chief is further in rear in a house with spacious writing rooms, where wire and wireless telegraphy, telephone and signalling appliances are at hand, where crowds of motor-cars and motor-cycles, ready to go any distance, are waiting for orders. Here, in a comfortable armchair, in front of a large table, the modern Alexander has before him the whole battlefield on a map; thence he telephones stirring words, and there he receives the reports of the army and corps commanders, of the captive balloons, and of the dirigible airships."

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* *Deutsche Revue*, January, 1909, "Der Krieg der Gegenwart."

It is an idea much in vogue to-day, and given here, perhaps, in too extreme a form, that the Commander-in-Chief, the supreme leader, ought to be far behind the front in a central position, in rear, surrounded by all the adjuncts of modern technics; but, surely, the question instinctively rises in all of us, whether it is really imperative for the General-in Chief to abandon, as here described, all personal influence, and to confine himself to *telephoning* from the armchair "stirring" words, the stirring force of which may then be fairly doubted.

It seems to me, we must not judge of matters in this one-sided and summary fashion, as was done there.

First of all, I think we must make a difference between strategic and tactical command. The operations of the army must, of course, be directed from a central office as was done by General Headquarters in 1870-71.

At such a place, the Commander-in-Chief can dispose over all the necessary rooms maps, and all the means for issuing orders. Here will also converge all the means of communication, chiefly, therefore, telegraph lines, for keeping General Headquarters constantly informed of all that is happening, and of the course of operations, and for transmitting its orders. Efforts will be made to change quarters not too often so as not to interrupt too much consecutive work. General Headquarters therefore follows the army only by stages. Army Headquarters manage in a similar manner so long as the operations are proceeding and the troops are marching, while, of course, Army Corps Headquarters will always remain with their troops.

But matters are altogether different the moment *tactical* command is involved. Here we will have to distinguish between cases of a varying nature; for the manner of command must be quite different when a single army is fighting a battle, or when even several armies are fighting united on the battlefield, from what it must be in a great battle, in which the bulk of the forces of the whole army are taking part in various distant groups.

In the latter case it may sometimes be imperative, owing to the great extent of the battlefield or owing to the distances apart from each other of the various local battlefields, for the Commander-in-Chief to remain in centrally situated headquarters, though the necessity for such action will surely not always arise. But his activity in that case will be altogether different from what the anonymous author of the "German Review" depicts. The Commander-in-Chief will then, of course, only deal with his army commanders; from them alone he receives reports, to them alone will he send his instructions. He will allow himself to interfere with the details of army commands, and to send orders to individual corps, only in exceptional and urgent cases. He only will retain direct command over reserves and sometimes over detached bodies. He will, no doubt, also abstain from sending stirring messages by telephone. All reports and news about the enemy, however, are not received by him in the first instance, but by the army commanders who control the dirigible airships, captive balloons, and other reconnoitring organs.

The army commanders, on their part again, deal directly only with the corps commanders, no matter whether the former are personally present on the battlefield or not. The main task of the Commander-in-Chief is, in such a case, to draw the strategic consequences from the results of the individual tactical decisions; with these he reckons as if with given factors.

Things, however, will take a different aspect when we have to deal with the battle of a single army, or with the combined battle of several armies—with battles, therefore, like those of St. Privat and Sedan. The Commander-in-Chief will in such a case certainly make use of all the technical adjuncts as well, in order to keep in touch with the various subordinate bodies; he will establish himself in a central spot, whereto all the means of communication converge. But he is not at all obliged to look for such a central place far from the battlefield. The very perfection of the mechanical means of communication makes him independent of any fixed position. Nor is he personally at all tied permanently to this central spot—to the armchair of a modern Alexander; for has he not the mechanical means of keeping in constant communication with it? He will, therefore, not let himself be deprived of the privilege, should he think it necessary, of intervening personally at the decisive points of the battlefield, and of inspiring the troops by his personality, as the great captains in every age have done.

Be the battlefield ever so extended, at one spot of the wide front the plot laid by the strategic and tactical conditions will thicken to a crisis. That is the point where the director of battle must be also found in future. Here his personal intervention may be of decisive importance, especially when troops of co-ordinate commanders are required to co-operate, as, for instance, was the case at St. Privat.

Two German armies were united here for battle—namely, the First and Second Armies. They encountered the enemy's position on a broad front. As soon as its extent was recognized, a glance on the map should have sufficed to reveal the fact that St. Privat was the decisive point. The French left wing was leaning direct on the strongest works of the fortress. Here, the greatest possible resistance was to be expected. Even if this wing had been successfully pushed back, it would only have brought the victor under the guns of the St. Quentin and Plappeville Forts. It was, moreover, then still possible for the French to retreat north, provided their right wing held its ground. But if the Height of St. Privat was captured, the whole position of the French army became impossible, the army being hopelessly pushed into the fortress. It was, therefore, merely a question of pinning the French forces to the ground along the whole length of their front; at the most, an attempt might have been made to support the frontal attack by enveloping the French left flank through the Bois de Vaux. But at St. Privat it was necessary to defeat the enemy. Here the Guard and Twelfth Corps were to co-operate. It was of the utmost importance to ensure their united and uniform action. But General Headquarters was not far from Gravelotte on the right wing, and Prince Frederic Charles was standing at Habonville, likewise far away from the decisive field. And so the co-operation of the two corps on the left flank was left more or less to chance, and it was merely owing to the goodwill prevailing everywhere that it was brought about at all. When the First Brigade of Guards attacked, the Forty-fifth Infantry Brigade was standing at the little wood of Auboué, intervening just in time on its own initiative when, in the moment of the crisis, Lieutenant v. Esebeck, likewise on his own initiative, called its attention to the serious struggle of the Guards. The Forty-eighth and Forty-sixth Infantry Brigades were but coming up. The Forty-seventh was standing in reserve behind St. Marie-aux-chênes, after having taken part in the assault on that village. A combined order for both army corps was altogether wanting; each acted in the way it thought best. If Army Headquarters had been on the spot here, matters would have been materially different.

Similar examples could be freely quoted from the Russo-Japanese War. If, for instance, Kuropatkin had been in person on the battlefield of Sandepu, he would have convinced himself of the advantage the situation presented, and could have altered his orders which were paralyzing the attack. But he remained in the central position, and meanwhile the battle was lost.

Whatever we may think, it is always the personal opinion based on what we see with our own eyes which is of decisive importance on the battlefield, because here not only come into play the mutual relationship of time, space, and force, as in strategic operations, but also directly those imponderable factors, which, produced at the moment, can only be appreciated when personally seen; it shows that he who voluntarily keeps away from the battlefield without any necessity for it, abandons at the same time the best part of what he can perform personally. The moment the Commander-in-Chief has become aware of the point where the main issue will be brought about, he must not hesitate to go there and separate himself temporarily from his centre of intelligence, with which he will, however, remain constantly in communication.

We here become aware of one of the advantages of the offensive. The Commander-in-Chief of the attacking army knows, as a rule, where he will decide the issue ; he can go there in person and accordingly arrange from the outset his whole intelligence service. But the General-in-Chief of the defending army must await the development of the attack before he can judge where the decisive issue will be forced on him, or where he himself will enforce it. It is only then that he can select a suitable position for himself and arrange for his intelligence service. That is one of the disadvantages consequent on giving up the initiative. Kuropatkin could have been on the spot on the morning of the attack at Sandepu, and could have at once adopted the most comprehensive measures. Oyama could not go until the decisive importance of the Russian attack had been recognized. He was bound to have the last hand in all his countermeasures in regard to space as well as to time. But neither ought he to have allowed himself to be tied to the comfortable armchair of a modern Alexander.

The Commander-in-Chief's place is to-day, as formerly, where the issue is decided, and where he can himself survey the decisive field of battle. The possibility of regaining his central position, in case of need, within a short space of time by modern means of communication, will facilitate his resolve of going himself to the battlefield. But it is the duty of the intelligence service to bring to him there the necessary news and to transmit thence his orders. Telephone, telegraph, motor cars, motor cycles, and flying machines are available for that object. To simplify as much as possible the apparatus needed for this, and to relieve the Commander-in-Chief in every possible way, to limit the receipt and transmission of reports and orders as far as possible—that is the duty of the staff. But the Commander-in-Chief himself must try to keep his mind and memory free from the details of events with which only the commanders of troops are directly concerned; he must only keep in view the great and decisive factors, and leave the rest to his subordinate commanders, but he must rapidly and vigorously intervene the moment the issue hangs in the scale. To act in this way is the most difficult, but the most needful task of the spiritual systematics, of generalship. The magnitude of the task grows with the magnitude of the masses engaged. On the one hand grows with it the number of reports coming in, which are only too apt to confuse the great features of the whole picture, and on the other, the measures once adopted can only be cancelled with difficulty and under penalty when large bodies of the army are involved which are sometimes far away. The weight of responsibility and the difficulty of rightly gauging effects and consequences have, before all, become greater. Only a great and open mind is equal to this task.

CHAPTER IX

THE IMPORTANCE OF PERMANENT DEFENCES

The importance of fortresses in modern war, p. 348—The defensive value of the fortress, p. 349—Altered value of the individual fortress for the whole issue, p. 350—Importance of the fortress in protecting the frontier, and as a sallyport, p. 353—Further importance of the fortress for the strategic offensive, p. 354—The offensive importance of Strassburg, p. 355—The importance of Breslau, p. 356—The importance of a fortress for a defeated army, p. 357—Necessity of fortresses in second line, p. 358—Construction and completion of fortresses in second line, p. 359—Offensive power and defensive capability, p. 360—Size of fortresses, p. 361—Strategic importance of barrier forts, p. 362—Coast defences, p. 363—Ruling factors for national defences, p. 365.

Having hitherto reviewed chiefly the elements of active field operations, we have now to consider a further branch of the science of war—namely, the permanent defences. To-day they are more than ever called upon to play a very important rôle in attack as well as in defence. They exercise a far-reaching influence also upon active field operations.

We are, generally, too easily inclined to look upon permanent fortifications solely as a means of defence, even of passive defence; for, originally, they were no doubt designed to satisfy the wants of local protection. We would, however, greatly err should we look upon the importance of fortresses in this narrow sense in modern war.

Just as war itself has grown from simple actions into those involving a powerful and extremely complicated mechanism, so has the fortress, too, lost, long ago, its limited character of local protection and of an adjunct to a pure defensive; fortresses are, rather, of considerable value in connection with the operations of modern war. General von Beseler, late director of German fortifications, pointed this out the other day in an essay published in a German quarterly review.* I can refer in all essential points to what he says there.

First of all it must be stated that even to-day a fortress may still be of value only for defensive purposes.

When it is a question of purely strategic defensive, fortresses, distributed all along the defensive front, can materially assist in the resistance of the armies. The fortresses themselves block a considerable area, and thereby give more freedom to the army in the field, to which they serve at the same time as a support on the flanks, and as depots.

If, again, the army is obliged to retreat, the frontier fortresses can stop the enemy, prevent him pursuing, and render his offensive altogether extremely difficult. Extremists have deduced from this fact the idea of designing the frontier defences as a continuous line. A continuous barrier against invasion can, as a matter of fact, be created, with every point commanded by artillery fire, if the works are constructed at distances from each other not less than twice the longest ranges of artillery used. Such an arrangement has, of course, all the defects and weaknesses inherent in all extensive cordon positions—namely, scattering of the forces on the long front in single posts unable to unite for action. It forces thereby the whole defence, as it were, to adopt wrong measures.

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* *Vierteljahreshefte für Truppenführung und Heereskunde*, vol. iii., 1910, v. Beseler, "Ingenieurkunst und Offensive."

Local protection is, of course, still one of the defensive objects of fortresses. If military workshops and quantities of stores are in a town; if important railway junctions are within its gates, or if railways and other important highroads are crossing great rivers on permanent bridges, it may be imperative to protect such places by permanent fortifications so as to secure under any circumstances the establishments, structures, and necessary stores contained in them. Lastly, the moral effect of retaining possession of a place may cause it to be fortified for a purely defensive object. If, for instance, Strassburg should fall into the hands of France when at war with Germany, it would certainly be a great material gain for the French, but would chiefly be a moral success of far-reaching consequences, which would assert itself to the disadvantage of the Germans, not only from a military point of view, but above all in the realm of international politics. The same, if not with more force, may be said if the Germans conquered Paris. The moral effect would be enormous, as in 1871.

Though the retention of a fortified place may thus sometimes be of the utmost importance, we can agree with General von Beseler when he says that the fall of a fortress—in spite of Paris—is not likely to decide, again, the issue of a war in the future. The fate of a nation—and in future it will be a question of national and not Cabinet wars—can never be decided by the capture of a town, may it be ever so important, or looked upon as important. The fact that in 1870-71 the French gave in when Paris fell, is no proof to the contrary. In the first instance, the importance of Paris in France was quite exceptional. All vital interests and spiritual forces were concentrated in the capital in a way scarcely found in any other country. A great portion of the French military forces was, moreover, locked up in Paris, being lost to the country when the fortress surrendered. This latter circumstance and the defeats of the Provincial armies in the west, north, and south-east, really decided the issue. If France had still had in the field an army of some size, resistance need not have ceased.

How little sometimes the loss of the capital signifies is proved by the Boer War. After Pretoria, the capital and only so-called fortress of the Transvaal, had fallen, and the whole country had been conquered by the English, the Boers continued the war for nearly two years longer without being ultimately defeated. The soul of a nation must be defeated and crushed before it is conquered. The possession of a fortress can surely achieve this only in quite exceptional cases, and indeed but always indirectly. When the whole people of a great State is called to arms, when the modern armies of masses are involved, the fight can never hinge around a single place, because the power of a nation can never be locally concentrated in this manner, and because a pure defence can always gain time only, but never directly decide an issue. Active operations alone, in which all the forces come into play, and in which finally every class of the population may be called up for a national war, decide on victory or defeat of a State; and to-day holds good still what Goethe makes Euphorion say:

"Keine Wälle, keine Mauern,
Jeder nur sich selbst bewusst;
Feste Burg, um auszudauern,
Ist des Mannes eh'rne Brust.
Wollt ihr unerobert wohnen,
Leicht bewaffnet rasch ins Feld;
Frauen werden Amazonen .
Und ein jedes Kind ein Held."
(*Faust*, II.) *

Goethe is right! Active field operations, not fortress warfare, decide the issue to-day more than ever. This is a natural consequence of modern war, which is no longer waged as formerly for limited objects, and often in a limited theatre of war, but is a tremendous struggle of whole nations—a struggle of physical, mental, and moral powers, in which the material forces do not decide the issue, but imponderable forces.

Exceptions are, perhaps, small States of no uniform national character, whose power of resistance centres around one vital point. In a war against Belgium, the capture of Antwerp would positively decide the issue; and in Switzerland the St. Gotthard fortifications with the mountains in front of them, comprising the Lake of Lucerne, have a similar importance. Here the various mountain districts would certainly allow the local resistance to be continued even after the fall of the main fortifications, which would scarcely be possible in Belgium.

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* Which may be rendered somewhat like the following:

"Have no walls, and have no ramparts,
Each, rely he on himself;
Firm a castle, to oppose all,
Is the man, himself, alone.
Do you wish to live unconquered?
Quick to arms and go afield;
Women will be Amazons,
And each child a hero, too."
TRANSLATOR.

A fortress would, therefore, decide nothing to-day in a war between two great States, and an army wishing to confine itself to a passive defence behind ramparts and ditches would completely misapprehend the nature of modern war. For this reason a continuous line of frontier fortifications must be described as an aberration. But it is, on the other hand, not only possible, but even imperative to make the land defences *subservient to the object of active operations in the field* and before all for *offensive* purposes. This we must always bear in mind.

At the beginning of a war, during the period of concentration, the rôle of a fortress is, of course, first of all purely defensive in the sense, as I have said before, of a support for strategic defence. During this period the frontier fortifications support the *protective troops,* not "as if these defences were a line of barrier forts or even a Chinese Wall, but as a protection of the most important road and railway junctions, and passages of rivers and mountains. The quicker this protection becomes effective, the better it aids the difficult and manifold duties of the frontier guards; it narrows the frontier to be protected, directly secures its most important points or portions, and is able to afford the frontier guards rapidly vigorous support or also a safe refuge."* The importance of the frontier fortresses has, however, not at all come to an end with this initial and purely passive rôle. "If it is at first a question of covering mobilization and concentration, it becomes then, after their completion, a question of keeping open the sally-ports into the enemy's country, especially where great rivers or large streams form the frontier or are accompanying it not far away. The critical moment of crossing a big river or stream, sometimes in the face of the enemy, if it is not avoided by spacious and effective bridge-heads, is at least a great deal deprived of its danger; the safe and undisturbed crossing under these circumstances is the first step to a vigorous offensive."* The offensive value of a fortress is, however, not restricted, as may be thought, to such special conditions, but must be imagined as of a much more general nature.

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* v. Beseler, "Ingenieurkunst und Offensive."

If an assailant wishes to advance to a certain point with his main force, to fight there in superior strength, he can gain the power for such an offensive in a war with an equal or even superior enemy only by sparing forces at another place. On the fronts thus weakened he must avoid fighting a decisive action and try to contain the enemy, be it by refusing one or the other strategic wing, or by an obstinate defence in close touch with favourable ground. Here the fortress comes to its own. Its nature consists in necessitating far stronger hostile forces to be employed for its capture than it needs itself for defence. On strategic fronts, therefore, which are to be held by weak forces, the fortress forms a material means of defence, rendering it thereby sometimes feasible for the offensive to look for the decisive issue at another spot. The

* v. Beseler, "Ingenieurkunst und Offensive."

fortress can, however, fulfil this object only if it actually attracts forces of the enemy considerably stronger than its own garrison, if it cannot be disregarded, and if the enemy is not allowed to watch it with weak detachments only. The fortress itself must therefore possess a certain amount of offensive power, which must be strong enough to oblige the enemy to use superior numbers against it, and must, on the other hand, cover objects the possession of which must be of great strategic importance to the enemy, forcing him to make real efforts for its capture. The latter we attain by the choice of the points to be fortified; the former, by the kind of fortification and armament.

Such a point, which by its situation and importance seems to be meant for a fortress, is, for example, Strassburg. It secures the most important passage over the Rhine against a French offensive into Southern Germany, and its capture or maintenance is of high moral value for the whole conduct of the war. If this fortress possesses, in addition, a certain amount of offensive power sufficient to disturb constantly the lines of communication of a French army which has crossed the river north and south of that town, the French who intend marching into Baden would be at least obliged to invest the fortress on both banks, and they would surely entertain an ardent desire of capturing it. And so Strassburg would make it possible to defend the strong line of the Rhine and the Black Forest behind it with comparatively small armies, allowing the Germans thus to gain strength and time for the offensive at another place. If such an offensive would, for instance, proceed from Lorraine, the Germans, after a successful decisive battle, could take from the north in flank and rear the French army which had meanwhile penetrated into Alsace and Baden.

Of similar and, at any rate, equally great importance is Breslau, on the German eastern frontier, to which, also, Field-Marshal Count Moltke attached high value. Breslau commands the most important passage over the Oder, and would, if it were a fortress, not only secure the German lines of communication with the allied Austrian army, but take in flank also any Russian offensive on Berlin, and therefore draw upon itself, and away from the decisive battlefield in the north, strong forces of the enemy if it has, itself, sufficient offensive power. Breslau would in this way not only considerably facilitate a German offensive from the Mark or Prussia, but also, jointly with Cracow, serve as an important strategic pivot and flank protection to an Austrian offensive from the south. But should the Russians, Poles, and Czechs make at some time common cause against Germany, Breslau as a fortress would then not only be of the utmost importance for maintaining Silesia, but would also most materially facilitate an offensive reconquest of a lost Silesia, if it can be held long enough by the Germans. In any great decisive war between the German and Slav races, which will be scarcely spared the Germans in the future, the great strategic importance of Breslau will become clearly apparent.

The fortress thus forms in numerous cases the lever for the offensive, especially of the numerically weaker party, and becomes, though indirectly, an important factor of a victorious offensive.

But the fortress is of equal importance to the side which, beaten after the first concentration, is obliged to retire in its own country.

Tactical victory has upset the initial equilibrium, actual or assumed, of the forces. The party beaten is for the moment thrown on the defensive, but is aware that a change in the conditions, and final success, can be brought about if it succeeds in resuming once more the offensive; for nothing but attack insures real victory—that is to say, the destruction of the enemy's forces. It is now a question of counter-balancing or crippling in some way or other the preponderance of force the enemy has gained. Here it is again the fortresses whose share it is to play an important and very active rôle, and, above all, the frontier fortresses. These must be able to attract strong portions of the enemy's army, and divert them from the forces with which the enemy is continuing his offensive. Whether these fortresses will satisfy this demand depends on their own importance, their situation, their defensive capabilities, and, before all, on their offensive power, which under any circumstances must be such as to oblige the enemy to take the fortress into account. The frontier defences, as General v. Beseler writes, must peremptorily say to the enemy, "'Stop here!' at the frontier, if our own army must withdraw again behind them after an unsuccessful offensive. The stronger the frontier defences are, and the more offensive power they possess, the more will the enemy be obliged to pay attention to them, the greater will be the number of hostile troops attracted by them, and the more they will relieve for the moment our own retreating field army. Gaining time now means everything. Not behind the walls of the fortresses, as the dangerous, or at least often misunderstood, doctrine of 'entrenched camps' seemed to recommend, but protected and relieved by *the fortresses themselves*, does it now become a question of reorganizing, of gathering new forces, and, when the time has arrived, of marching once more against the enemy. The land defences do not want to entice or condemn the army to fight behind 'rampart and ditches,' but to give it the chance of making the best use of ground, mobility, and power of manœuvring, and thereby enable it to resume the offensive."*

It is, I think, obvious that frontier fortifications alone will not suffice for this. They alone will hardly attract hostile forces enough to counterbalance thereby the material and moral losses sustained in the battles during or directly after concentration. The frontier defences can, moreover, comply with the task of affording the beaten army increased power to manœuvre and of enabling it thus to resume the offensive, only if the bulk, at least, of the enemy's army is arrested by them. This is surely possible only before a continuous line of fortifications, or before a fortified river barrier difficult to cross. If only a few important points on an open frontier have been changed into fortresses, large portions of the hostile army are sure to break through between them. The same will happen when a successful assailant breaks through any cordon-like frontier fortifications that may exist, which will always occur after a victorious battle. If, therefore, the object is to be attained of procuring for the beaten army strategic pivots, *fortresses in second line* must be available, to which must be attached a similar rôle for the resumption of the offensive, as is attached to the fortresses in first line during concentration. They are to detain strong forces of the enemy, render feasible a containing defence with weak portions of the army, and thereby procure the strategic defence, also, in this second phase of the war, the chance of concentrating its main forces for a decisive offensive. This seems to me to agree, too, with General v. Beseler's opinion.

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* v. Beseler, "*Ingenieurkunst und Offensive.*"

What importance might Pretoria and Bloemfontein have gained, what turn might they have given to the war, if both these towns had been fortresses capable of defence, and strong in offensive power? The same may be said of Orléans. The tide of the German offensive would have receded before its works if it had been a fortress.

It is another question whether the system of fortification in the second line is to be, in peace, of the same permanent nature as the frontier defences, which become active the moment war begins.

The question may be viewed in different ways. Whereas the frontier fortifications are of use under any circumstances, the chance of the defences of the second line becoming of practical importance may not at all occur. There will, moreover, be only a few points which in such a case will be, under any circumstances, of importance, and retain this importance as strategical points, no matter how the enemy's invasion proceeds. Lastly, strategic points of this sort need not have such great power of resistance as the frontier fortresses which sometimes must be able to hold out for months and years if they are to fulfil their object. Port Arthur, which may be looked upon as a frontier fortress, is a striking example of this, while, on the other hand, the provisional fortifications of Liaoyang did not suffice to give the town the value of a strong strategic point, and relieve and support the Russian army sufficiently.

The question involved here needs mature consideration. It is, perhaps, solved best if points are permanently fortified which have an undoubted and lasting importance in opposing hostile invasions, while for other points, which under certain conditions may become prominent, some provisional fortification may be prepared in amplification of a permanently constructed framework, and artillery held in readiness for them. We may consider Mainz and Magdeburg in Germany as strategic points of first rank, which, under any circumstances, are bound to play a rôle in the resumption of the offensive by an originally defeated army.

Agreeing, as I think I do, with General v. Beseler in these questions, our views meet also on the point that he too requires the fortress to have great offensive power, and as wide a radius of action as possible, if it is to fulfil its strategic object. The fortress must possess a high degree of "striking power," that is to say, it must command as large a space as possible, with the long-range guns of its outer-works and with its mobile main reserve. Wide command of the foreground of this kind is the first demand that must be made upon the fortress from a strategic point of view, and the whole design of the fortress must make an offensive defence altogether possible. On the other hand, its power of resistance must be raised to the utmost by all the technical means available, to force the enemy, who wishes to take possession of the fortress, to make the greatest exertions. Armour and concrete must not be spared, and the artillery armament must be up to date in type and number. The greatest value must also be attached to an ample equipment of provisions and ammunition, so that want may not force surrender at a moment when the maintenance of the place is, perhaps, strategically of the utmost importance. If Port Arthur had held out only a few weeks longer, the whole war might have taken a different turn.

Although the fortress must have great striking power, it must, on the other hand, not be so large as to necessitate a considerable portion of the field army being riveted to its defence. The garrison, even in a most active defence, is always to some extent tied to the place, is locally bound, and thus withdrawn from the decisive field of action. Army fortresses *in the sense* of needing an army for their defence, or even being able to afford protection and shelter to a defeated army, are therefore very objectionable. A fortress, as we have seen, is meant to support an army, but not to protect it. Experience has, moreover, proved how difficult, nay, even how almost impossible, it is for an army invested in a fortress to escape the embrace of an enemy and to regain its strategic freedom. All attempts of Bazaine and Trochu to break the investing ring before Metz and Paris failed against the German lines. A battle of this kind must always be fought out purely frontally.

That is its weakness. It is difficult even for superior numbers to assert themselves under such conditions. Knowing all this, we must put a certain limitation on the size of the fortresses; nor must we be induced by favourable ground when constructing the fortress itself, to transgress certain limits. The intention of maintaining as fortresses towns beyond a certain size may paralyze the whole conduct of a war, and the defender of a fortified place must never open its gates to a defeated army for permanent sojourn and thus withdraw it from active operations in the field. The leading idea must always be paramount, that the fortress is a *strategic point* and not a *protective rampart.*

The strategic importance of a fortress reveals itself, for the rest, not only by the fact that it facilitates the offensive of our own army, and sometimes even makes it altogether only feasible, but also by the fact that it renders the enemy's offensive difficult. Forts covering railways, bridges, and mountain passes are, in this respect, of special importance.

Every modern invading army needs, as we have seen, ample lines of communication, so as to be able to operate freely. If, when penetrating into the enemy's country, the army finds the main railway lines not only destroyed, but also blocked by permanent works, it is more than ever hampered in its advance and in all its movements, owing to its size, which again is a product of modern conditions. The construction of circumventing railways, or the capture of barrier-forts, demands a great deal of force and time, the latter being of special value to the defence. Fortifications blocking bridges and mountain passes, also fully justify their existence, therefore, only if they can be held even after having been turned—if they therefore form a permanent obstacle to the enemy's communications. A bridge-head, which can only be defended on one side, is, as a rule, not worth the money spent on it. Every turning movement which a successful enemy can always execute, obliterates its value, and the small gain of time obtained, perhaps, will scarcely ever counterbalance the moral injury which a lost work signifies. Half measures are perhaps nowhere more injurious than in the realm of land defences, *because here half measures are stamped with a permanency* which is bound to have a detrimental effect. The value of *strong* barrier-forts on the main lines of communication is, however, incontestable, and must not be underrated. In a defensive war they will undoubtedly render conspicuous service, which will prove all the greater the stronger the passive power of resistance, and the more effective the artillery armament of the works are; while, on the other hand, they need not have any offensive striking power. Permanent works blocking railways may prove most valuable chiefly on frontiers crossed by comparatively few lines.

A branch of land defences, more particularly important for Germany, is the protection of the German coasts by permanent works, which may sometimes be exposed to the attacks of the far superior and not distant English fleet. This protection, like any fortification, bears in the first instance a purely defensive character. The great naval fortresses must not only be protected against attacks by sea, but also by land, since it is quite possible that they may be threatened by a hostile invasion or hostile landing-corps. For it is certainly a fact that Wilhelmshaven, for example, is separated only by the narrow strip of East Friesland from the Dutch frontier, whence a hostile advance is quite possible. For a purely passive defence are, further, meant the fortifications of points offering especial facilities to a hostile landing. They are to keep off and damage as much as possible the hostile ships, by the long-range fire of their heaviest guns. These fortifications will for this purpose often act in conjunction with mines blocking the channels within the most effective range of artillery fire, the same as will the batteries constructed for the purpose of giving protection to the naval fortresses and commercial centres. Torpedoes, too, will be tried against hostile ships from the land side, especially if we succeed, as is hoped, in guiding them during their passage by wireless electricity, and increasing thereby the chances of their striking the ships even at a great distance.

But in addition to these purely defensive objects, coast defences have also an offensive purpose to which some special importance must be attached. The frontier fortifications being designed for more than a purely passive defence, this rule applies in a far greater measure to the permanent coast defences.

In countries with strong navies commanding the sea, it is, of course, different. There, the defensive object is by far the most paramount, because the fleet itself is strong enough to look for and attack the enemy on the high seas. Matters are not so favourable in Germany. Her fleet is not strong enough to assume the strategic offensive under any circumstances —to go forward boldly to meet the hostile fleet, and try issue on the high sea. A defensive attitude may be forced upon the German fleet by a very superior enemy. In such a case the fleet must act like the main reserve of a beleaguered fortress. It must not enter into decisive battle with the superior enemy, but must try to injure him continuously by repeated and sudden attacks against portions of his forces. I will discuss in a later chapter how this combat is to be conducted. Here it is only a question of drawing the conclusions from such a state of affairs for the coast defences.

They must keep open the gates for the offensive strokes of the fleet—that is to say, they must be pushed far enough in advance, or command the sea far enough with their artillery, to allow the fleet to issue from the port defiles and deploy for attack. They fulfil their object in a full measure only if they comply with this demand; it is this which constitutes their offensive importance, which grows all the more the more the defence is bent on breaking the assailants' superiority gradually, and forcing him to give up his intentions—that is to say, the more the defence therefore tries to abandon a purely passive rôle.

At any rate, all that has been said makes it clear how high and manifold the demands are which, from all sides, are made upon the land defences, and how difficult the problems are with which they have to contend. Developments of many and various kinds, which are still hidden in the lap of the future, it is true, are casting their shadow in advance, and make things look rather problematical. We must, moreover, remember that with the rapid development of mechanics, fortifications become most of all very quickly obsolete, and, therefore, that it is always dangerous, to spend large sums on works which are up to date to-day, but may be antiquated and nearly useless to-morrow. We must, in consequence, look far ahead—we must calculate in advance the possible development of things, and take them into account, if it can be done with some degree of certainty. Yet, in spite of all these difficulties, we must always act in accordance with clearly-defined principles, which, unfortunately, we have not always done in Germany. Transient political constellations, one-sided personal views, and paltry financial considerations, must in no department gain a less decisive influence than in that of land defences. Only great and lasting principles, resting in the nature of things, must be decisive here. New advents, however, which may result from the achievements of modern technics, must never find us unprepared. To Prometheus only belongs the future, not to Epimetheus.

CHAPTER X

THE MEANS OF NAVAL WARFARE

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In the last chapter we discussed briefly within the compass of land defences, coast defences also, and we came to the conclusion that in the same way the land defences gain their full importance only in co-operation with the field army, so also would the coast defences gain their importance only in co-operation with the fleet.

For this reason alone it seems imperative to refer briefly also to the means of naval warfare. But there is a further reason, and this is that in future a war between World Powers must always be fought out on the ocean as well. Land and naval warfare will, moreover, of necessity frequently affect each other. Only small and unimportant States are now altogether limited to a war by land. Great Powers, especially those with colonial possessions and a highly developed trans-oceanic trade, have interests in almost every part of the globe, offering, therefore, everywhere points for attack which need protection and defence. The latter can only be effected by the fleet, the fleet alone being able to secure the connection of the mother country with the trans-oceanic colonies, and to keep open the trade routes to the various countries for export and import of goods. The fleet can likewise proceed but offensively against the colonies and trade routes of the enemy; lastly, the home country, with its coastline, cannot be permanently and effectively protected without the co-operation of the fleet. These conditions, when a war breaks out between two World Powers, must always lead to naval warfare, to a combat of the fleets with each other. If we want to arrive, in some measure, at a clear conception of what this combat and its possible issue will be, we must first of all try to realize what a fleet is composed of and what it can do.

As in war by land, various arms exist for different objects of warfare, so in war by sea we try to meet the varying requirements of war by special types of ships. Reconnaissance, the battle, coast-defence, and enterprises against the trade and colonies of the enemy demand a great diversity in the structure of warships. The subsidiary services must also be considered. Workshop, hospital, coal, and other transport ships supplement the apparatus of a naval force.

Only ships of the line of the *Dreadnought* type can be considered to-day as fully efficient battleships; of course, not only ships faithfully representing this type in every detail, but all those ships which, as regards armour, artillery armament, and speed, are of equally great fighting value—ships, therefore, generally of at least 20,000 to 27,000 tons capacity. But it is not the size alone, as we might think, which determines the type; the size is only a result of the demands made by tactics. To-day, each unit is required to contain the greatest possible concentration of force—that is to say, to contain with a maximum of speed and strong armour a uniform armament, with as many guns of the heaviest calibre as possible, so as to fight the decisive action at *a distance*, because the superiority of the guns over the armour and the increased range of torpedoes make it dangerous to approach to closer distances.

This principle of fighting the decisive action at a distance allows at the same time the strength of armour to be reduced in some measure and the weight thus saved to be used for armament, speed, and radius of action. The stronger armament implies a material increase of offensive power; with the greater speed we believe we can preserve the self-chosen fighting distance opposite a slower-moving enemy, and envelop him, while we ourselves are secure against being enveloped.

The armament is the main factor in determining the type of ship. Until to-day, guns of 28 to 30·5 centimetres calibre were generally used for the main fire-action. England and France have, however, already adopted some guns of 34 and 34·3 centimetres calibre, and America is on the point of introducing guns of 35·6 centimetres calibre. The reasons which have led to this step being taken, have already been explained.[*] Germany will be obliged to follow this movement within certain limits, and has probably adopted heavier calibres for her latest battleships, because her present 28-centimetre gun is no longer—as it used to be—sufficiently superior to the stronger guns of her likely antagonists.

For the moment it cannot yet be foreseen whether, and to what extent, the main armament will be *further* strengthened by everybody. Increase of tonnage and thicker armour would probably be the consequence. How far we can go in that direction must be left an open question. Size by itself is an advantage. The big ship with greater speed offers comparatively less resistance in the water than the smaller one; in a big ship, moreover, all things being otherwise proportionally equal, more weight than in smaller ships is relatively available for armament and its protection. If the size is increased, the specific weights of the bodies of the ships remain proportionately about the same, but the proportionate weight of armour, engines, fuel, and equipment decreases, so that weights become available, which can be used for artillery or for armour and speed as well.[†] Larger ships have, besides, greater buoyancy and stability, which latter chiefly increases with the beam. On the other hand, we must bear in mind that although the fighting power of the ship grows with her size, the blow in losing her is all the more felt. This danger is naturally always present in a naval war, and makes it, therefore, advisable to keep within certain limits as to the size of the ship—limits which are indeed difficult to define. The power of manœuvring, too, decreases with the size of the ship, the proportions being otherwise equal; and finally the ship's draught must be considered. The draught need certainly not increase in equal measure with the greater size of the ship, so long as she is given greater length and breadth. For all that, certain limits must be kept in this respect as well.

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[*] Part II., Chapter III., p. 137.

[†] Nauticus, 1911

The German artillery material being undoubtedly of a superior kind, her navy can do with smaller calibres than other naval powers without losing in effectiveness. This fact makes it possible to keep within certain limits in fixing the size of the ships as well, because armour, armament and size have definite relations to each other. It is difficult to judge how far it may seem advisable to make use of this—for the Germans—favourable circumstance. Equality must, at any rate, be preserved with the hostile ships; we must even try to attain some surplus in speed. If this is only small, it will certainly not be a material gain, and we must not for its sake weaken the remaining fighting power of the ship.* But if there is great superiority in speed, it will mean a very considerable advantage. It is a factor which gives superior leadership the chance of asserting itself. Should we succeed in making protection by armour more effective, in other words, should the armour-plates offer greater resistance than is possible with the present state of mechanics, and thereby save weight, this surplus could be used best for increasing the speed. Experiments are made in England to that effect at the present moment with a metal called "molybdenum," the resistance of which is said to be 20 per cent. greater than steel. The results obtained with it are still doubtful. Hitherto, all attempts to beat the present steel armour have, as a matter of fact, failed.

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* Nauticus, 1907.

In addition to the main armament of artillery the modern battleships are equipped with a *subsidiary artillery.* This can be distributed in three ways: by arming the ships with guns of *medium calibre,* or with *light calibre,* or with a *mixture of both.* Medium artillery is meant to act in a battle during day by a rapid fire of common and high explosive shells, promising all the more favourable results, since about 60 per cent. of the total lateral surface of a modern warship can be hurt by the projectiles of medium artillery. They are the projectiles to be used against minor targets like small cruisers and land defences as well.* The medium guns may lastly be employed also as anti-torpedo guns. For this purpose quick-firing guns of a light calibre have been used hitherto, but lately efforts are being made to fight the torpedo boats by day with stronger calibres, the torpedoes, as we have mentioned, being much more dangerous than formerly at long ranges, and the light guns not sufficiently effective at these ranges.

France has gone so far as to introduce a 16·4 centimetre quick-firing gun for torpedo defence, and in England experiments are even made with the object, it is said, of using heavy artillery against torpedo-boats. All navies are, at any rate, occupied with increasing to the utmost the rapidity and accuracy of fire of the largest calibres, even using electric and hydraulic power in handling the guns, and by ingenious laying apparatus and range-finders. Especially in torpedo defence and for the concentration of fire in critical moments of the battle, a maximum rapidity of fire gives decisive advantages.

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* Nauticus, 1911

Besides the medium guns the light ones are still retaining their importance. Their more rapid fire and easier handling render them particularly useful for torpedo defence by night. They are an important adjunct to medium calibres.

These medium guns were first thought of after the Chinese-Japanese War, when the kind of armour at that time and the use of inflammable material in the construction of warships promised great effect for that artillery. England has meanwhile altogether given up the idea of medium artillery. Lately, however, she seems to have again taken up the idea in a decisive fashion. Germany has stuck to the medium calibres in addition to the light anti-torpedo guns even in the latest types of her ships, and thinks she is doing well by it.

Besides their artillery armament, the modern ships of the line are equipped with torpedo-tubes to allow the use of torpedoes as well. These tubes are placed below the water-line in varying numbers, partly as broadside tubes, partly as stern or bow tubes.

The torpedo has in recent times developed into an arm of great importance. Its speed as well as its range have considerably increased, and weight has been added to the explosive charge. These improvements are chiefly due to the steering apparatus and the hot-air arrangement. The torpedoes of to-day are, moreover, constructed to cut through the torpedo nets without exploding, doing so only when striking with their hardened steel head the body of the ship, which they should strike below the armour belt.

The 45 centimetre torpedo hitherto in general use, which was fairly effective up to ranges of 300 to 400 metres, has been developed into an arm of precision with a range to-day of 6,500 metres and a charge of 100 kilograms. It seems pretty certain that a torpedo of 53 centimetre calibre will be universally adopted, several navies having already done so. Efforts are also being made, especially in England, to lengthen the torpedo, so as to increase still further their range and speed. Ranges of 9,000 metres and a great velocity are said to be attained already by a newly constructed torpedo in Japan and England. Should we succeed in attaining altogether ranges equalling the distances at which actions are nowadays fought, and in steering the torpedo in its course by wireless electricity, it would become one of the chief arms of the battleships in addition to their artillery. The effect of the torpedo would be enhanced by the use of the so-called "Winkel" torpedo,* on the perfection of which all care is bestowed, its introduction being merely a question of time.

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* Nauticus, 1907.

The development in all that concerns torpedoes—the development itself having been influenced by the growth of the ships—has caused a greater value to be attached in all modern ships to the protection below the water-line. This protection is generally looked for, on the whole, in a strong longitudinal bulkhead some distance away from the outside wall of the ship with plenty of compartments, and by making use of the advantage of the greater stability of the ship as obtained by a greater breadth in proportion to length and draught. The breadth by itself allows the bulkhead to be placed further away from the outside wall of the ship. But the greater stability, when the ship is injured and when only a few compartments of the bulkhead are flooded, decreases the list of the ship and causes her to sink comparatively slowly even should the longitudinal bulkhead itself be injured when heavy damage is done to the side of the ship. At anchor the ships are, besides, protected by torpedo-nets. The future will show whether we shall be obliged to adopt further measures against the improved torpedoes.

To face the greater efficiency of artillery the armour had to be thickened. But the increase of weight entailed thereby has limited the portions to be protected, and the consequence is that protection by armour has shown a tendency to decrease. Only the most vital parts of the ship, and first of all the engines, are now made sufficiently safe by a combination of vertical and horizontal armour and coals.

It is obvious that all these conditions were bound to affect the conduct of an action. The increased effect of artillery, the comparatively small protection by armour, and the greater range of torpedoes have, first of all, caused the fighting distances to become considerably greater. At the time of the Russo-Japanese War, fire action began at about 6,500 metres range, because the tactical employment of artillery was confined to this limit; somewhat beyond 6,000 metres the first effect was obtained against guns behind armour, and it was not before 3,000 metres was reached that the main armour, protecting the engines, was pierced by a steel shell. Ships of the *Dreadnought* class (1908) now produce the same effects at 9,000, 6,000, and 3,500 metres respectively. But ships commissioned in 1912 can begin a fire action already at 10,000 metres range, while guns behind armour are liable to be struck at 7,000 metres range; armour protecting the engines, in spite of its thickness of 305 millimetres, can be pierced; and torpedoes are already effective at 6,500 metres, their maximum range being in 1904 only 1,200 metres.*

It is the same process which, *mutatis mutandis,* has come about in war by land—namely, increase of fighting distances, and increased demand for protection owing to the greater effect of fire. It must be left an open question whether the closed formations hitherto used will have to be abandoned, like those in war by land. To-day the fleets fight in close units—squadrons and divisions—where the ships either follow each other at a distance of 300 to 400 metres (line ahead), or steam abeam of each other (ships in line). But in England an opinion has already been expressed that the progress made by the torpedoes would lead to the fundamental tactical principles being altogether changed within a measurable time. As the accuracy of the torpedo at long ranges against individual ships is very small, but very great against a number of ships in close formation, the development of tactics will cause a complete dissolution of fighting formations. As regards the type of ships, battleships and armoured cruisers will probably be amalgamated.* Details about the latter ships will be given later on.

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* Nauticus, 1911.

Besides the battleships of latest type, all navies have some ships of older dates in use still, which must be taken into account. These ships are slower and less efficient than the former; their medium artillery has calibres from 15 to 19 centimetres; the number of their heavy guns—in Germany up to 28 centimetres—is much smaller than those on the *Dreadnoughts*, and their anti-torpedo artillery is for the most part of smaller calibre. Many of these ships have also tubes for launching torpedoes. Under these circumstances, their use as battleships side by side with the ships of recent construction is of little account; they could not fight *Dreadnoughts* at all, because they would be at too great a disadvantage. But they retain some importance even to-day, because all navies are keeping ships of this kind still in commission, and they will be called upon to fight each other. They are certainly also of use for attacking the enemy's coasts, his small cruisers, and for similar objects.

All ships of the line are equipped with searchlights for the purpose of discovering and warding off torpedo attacks during night. But fears have frequently been expressed that owing to the increased range of torpedoes the searchlights do not reach far enough to discover in time the dangerous boats. Experiments are therefore made in England with star-shells, which have a very much greater range.

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* Lecture of Admiral Bacon, "Marine Rundschau," May, 1910.

A necessary supplement to the actual battleships are the cruisers, which may be ranged under two types—namely, the large or armoured cruisers, and the small or protected cruisers.

The chief object of the former class is to reconnoitre before the battle, to participate in the battle, and to pursue or give protection after the battle. Sometimes they are also to serve as a support to the torpedo flotillas, of which we will talk afterwards.* If they are to fulfil all these objects, they must have, above all, a maximum of speed, which, jointly with great fighting power, must be permanently equal to that of the small cruisers and torpedo boats. To attain this speed, and to provide the ships of that class with a strong armament of heaviest calibres needed for battle, the armour had to, and could, be kept low; the saving of weight thus obtained could be used to strengthen the engines and increase the fuel. Their great speed enables the armoured cruisers to take up in battle the fire position best suited at the moment against ships of greater fighting power, but of less speed and mobility, and to concentrate their fire in the decisive direction, thus effectively supporting their own battleships. The large cruisers constructed for these objects are therefore counted as battleships. They are consequently provided with torpedo-tubes, like the actual battleships (in Germany with two tubes in each side, and one each in the bow and stern), and are given every protection below the water-line. Their greater speed and the large amount of fuel they carry give these ships a wide radius of action, being therefore useful for distant operations. They can thus also be used for reconnoitring at a great distance, and for foreign service during peace. They are too valuable to be used for preying on the enemy's commerce.

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* Nauticus, 1909: "Die Kreuzerfrage."

It must be left to experts to fix the proportion the armoured cruisers should bear to ships of the line. Tactical principles will chiefly determine this proportion; but there seems no doubt that Germany is paying too little attention to this question, and does not, perhaps, fully appreciate the importance of these ships.

Besides the large cruisers, the nature and duties of which we have just described, the small or protected cruisers have become a necessary type, owing to the development of the torpedo boats as an efficient arm since the eighties of last century. The main duties of the small cruisers are to attack the enemy's torpedo boats, and to give protection against them. They are therefore first of all torpedo boat destroyers. This settles their type—namely, before all, a maximum of speed. That necessitates large capacity for fuel. The armament must be chiefly designed for fighting torpedo boats. It must therefore consist, first of all, of quick-firing guns of medium and small calibres. These ships are, moreover, provided with torpedo-tubes—at least in Germany—to fight an equal enemy. Their armament, as well as their great speed, make these ships also useful on intelligence service and in commercial warfare, and permit them to co-operate with the armoured cruisers. But these minor duties must never interfere with their actual type as destroyers.

The cruiser types, as here described, are of course not everywhere and in all navies so clearly defined. The two classes of cruisers are perhaps most clearly distinguished in Germany. The cruiser question is for the rest a very much contested one; this type has been very much experimented upon, and there are in most navies numerous cruisers fulfilling the conditions of neither the one nor the other type completely, but representing medium types meant to serve different purposes, and constructed without definite regard to some particular activity.

An essential part of every naval force are the torpedo boats. Their chief duty is to attack the hostile ships with torpedoes. But this idea was not strictly adhered to everywhere; other duties were assigned to these boats in addition, and this caused them to be designed conformably. In this way two main types have developed—the actual torpedo boat and the destroyer. The former is designed purely for attacking the enemy's fighting ships, and is therefore equipped with a strong torpedo armament, artillery being quite subsidiary. The character of the destroyer is determined by its stronger artillery armament, which enables this ship to fight, especially, an enemy of the same type and the hostile torpedo boats, the torpedo armament being a secondary consideration. England, France, and the United States give preference to these ships. Germany has consistently adhered to the type of the pure torpedo boat; she has strictly kept to the original idea of torpedo attack on ships as the determining factor. The spirit of offensive is clearly indicated by the speed, seaworthiness, endurance, and armament of the German boats.

The torpedo boats are therefore used for other purposes exceptionally, and in case of need only. According to German ideas, they are of little use, particularly in reconnaissance. They are too small, exact navigation with them is scarcely possible, and in bad weather their speed rapidly falls off, the hostile cruiser becoming then superior in speed. Other navies often use the destroyers like cruisers, for reconnoitring and protection during night when under steam. They are also to be used for laying mines and searching for such. It is obvious that to employ the ships in this way must tend to distract them from their real object, the various kinds of employment affecting plainly the training in peace. For the rest, the difference between torpedo boats and destroyers is not always clearly defined, they being often merged one into the other. The German torpedo boats are almost as large as the English destroyers, and England seems to come round again to the German point of view. War only can decide which system is the more suitable.

The small torpedo boats formerly in use are altogether discarded. Boats are now built up to 700 tons displacement. These vessels can develop considerably greater speed, with a much wider radius of action, than the former ones ; they are much more seaworthy, and are equipped with an artillery suitable to fight hostile boats of a similar type. On the other hand, England, France, Austria, and Italy are building second-class destroyers (coastal destroyers) which, with a lesser radius of action, with lesser steam power and speed, serve more for local defence, and can be procured in greater numbers owing to their smaller cost.

As regards, now, the action of the torpedo boats against the hostile fleet itself, we must distinguish between attacks by day and by night.

During the battle by day the torpedo boats must keep beyond the range of the hostile artillery, and under cover of the ships of the line. But there is a chance sometimes for an effective torpedo shot at a long range, especially if the boats are attacking in large units. They must, at any rate, try to help at the decisive moment, when the hostile battleships, already much damaged, are hotly engaged, and no longer able to use all their artillery. It is then for the torpedo boats to complete the work of destruction.

Their real sphere of action is, however, the attack at night, when darkness permits the hostile fleet to be approached unnoticed, and shots to be directed at it from effective distances everywhere under 1,000 metres. Independent action in this sense is the very essence of torpedo warfare. On the high seas, as well as in coast defence and against hostile blockading ships, they can in this way render most valuable services. Their own cruisers will often be sent to accompany them in support, and as a protection against the enemy's cruisers and destroyers. But the chance of surprising the enemy must not be jeopardized by measures of this kind.

The desire to give more offensive power to coast defence than is afforded by torpedo boats, has led to the construction of various types of submarine boats, distinguished as diving boats and actual submarines. Their difference is the following: the actual submarine boats (sous-marins) have only electric motors, and are completely closed. They have to rely entirely on these motors, whether swimming on the surface or moving under water. They have therefore no other motive power than that with which they originally start; they are helpless when that is used up, and they must therefore keep in close contact with their base on land, so as to keep themselves constantly supplied with fresh motive-power the moment this want arises. The diving boats, on the other hand (submersibles), in addition to electric motors for moving under water, are equipped with a second engine for moving on the surface, and for recharging the accumulators and dynamos when their storage of power is exhausted. Steam was formerly used as motive power, but now it is probably everywhere gasoline. For diving purposes the gasoline engines are shut off, and the boat is completely closed. The diving itself is effected by filling the ends of the boat with water, thus giving the boat some inclination, or by pressing the boat mechanically down by some special appliances.

The modern boats are all more or less built after the pattern of diving boats.

These submarines are meant to approach the hostile ships by day unseen, being equipped so as to attack these ships with torpedoes. The torpedoes are the only weapon of the submarines. For *observing* the enemy and to find their own way about, the boats are provided with an observation tube projecting above the surface of the water and reflecting by mirrors what is happening on the surface of the sea. The speed of these boats and their radius of action are comparatively small in all the boats hitherto designed. But the tendency is to give these vessels greater offensive power than is now customary—that is to say, to increase their radius of action, their speed, and their seaworthiness, to develop further their diving power, and to construct them so as to move longer under water than they can now. These objects will cause a gradual increase of displacement.

Should we succeed in raising their offensive power materially in this way without augmenting the displacement unduly, they may become a terrible weapon in naval warfare and decisively co-operate in battle. France especially has made great strides in the design and construction of submarine boats, and has opened the way in this branch. Germany has not lagged behind the other States.

A speciality are the mining ships, built for the purpose of blocking with mines large tracts of the sea, the mouths of rivers, entrances to ports, and narrow straits of the sea, either as a safeguard against hostile attacks or to hamper hostile navigation in those waters. In the latter sense the Japanese tried to seal the Russian fleet in Port Arthur, by blocking the port with mines. It is true they did not succeed, yet they have caused the Russians heavy loss in this way though certainly suffering loss themselves. There are various modes and systems of laying mines. The mines are either anchored after a definite plan at a definite depth (regular mines), or thrown overboard by ships in motion according to wants, when the mines automatically anchor themselves and remain at a definite depth (scattered mines). The latter are always contact-mines, that is to say, mines which explode the moment they are touched; they are, therefore, dangerous alike to friend and foe. The former are likewise contact-mines, or mines which can be made to explode by electricity from the land as soon as the enemy comes within their range. They are harmless to friendly ships even when accidentally touched, but need complicated arrangements for ascertaining on land the right moment for explosion. Mines not anchored are called drifting mines. These drift about with the current and waves, whereas the anchored mines are fixed in one spot.

To guard against the danger of mines, special ships are constructed to search for such and render them harmless. Efforts are made, on the other hand, to give the warships better protection against the danger of mines by strengthening the body of the ship below the waterline in the same way as against torpedoes. But the means used to that end cannot be relied on so far.

It scarcely needs mentioning that the battle, cruiser, and torpedo fleets have to be provided with a certain number of transport ships, which must be all the greater the more extended the field of action is in which the war must be carried through, and the further the enemy to be attacked is away from our own coasts. The object of the transport is, foremost of all, to keep the fleet supplied with coal and material for working the engines. They are designed for rapidly delivering coals on the high seas. But they have, of course, to provide the fleet also with all other wants, and must be equipped partly as hospital ships and partly as workshops. In the latter capacity, they will allow of extensive repairs being executed, which it is impossible to carry out with the means available on board ship. It is a matter of course, in the present state of mechanics, that all ships belonging to the high-sea fleet and its transports are furnished with wireless telegraphy appliances, searchlights, and anti-torpedo guns.

Orders are issued by means of wireless telegraphy, flag-signalling, semaphore, and other visual means of communication. The fleet in Germany is divided into squadrons of ships of the line, which are again subdivided into two divisions of four ships each. For reconnaissance, "reconnoitring groups" are formed, consisting of one to two armoured cruisers and three small cruisers. The torpedo boats are organized in flotillas formed of ten boats each and one flotilla boat, these being again subdivided into half-flotillas, each consisting again of two sections of two or three boats each. Mine-searching divisions are composed in a similar manner of older torpedo boats. The submarine boats are employed singly, and special ships according to wants. The transports are taken from the merchant fleet.

Air-craft is a new adjunct to the means of warfare by sea as well as by land. So far we have not yet succeeded, as has already been explained, in constructing them for military use under any circumstances. The present dirigible balloons do not yet possess the requisite durability, the height of flight that must be demanded, nor sufficient speed, which are all necessary for the exigencies of war. But this last-mentioned quality is of special importance, on the high seas in particular, because there the wind is very much stronger than on land. If mechanics succeed in getting rid of these defects, balloons will gain a high importance in naval warfare. They are of some value already to-day, as several of their performances have given enough satisfaction in favourable weather.

In the first instance they will serve reconnaissance the same as on land. The balloons will often render good service in reconnoitring entrances to ports, channels, and likely booms, as well as in watching the hostile fleet and, especially, blockading squadrons. They can also be used on the sea for visual signalling.

But no great value can be attached to the captive balloon, which may be used on the coast as well as on ships specially designed for that purpose. The range of view is, of course, greater here than on land owing to the unrestricted horizon; the objects of observations are, moreover, more easily detected. Owing to the great transparency of sea water it was possible even to watch submarine boats in their movements. But captive balloons are unable, as a rule, to stand the strong pressure of the wind on the high seas. They generally cannot rise high because they drift off too much to leeward, and are thus liable to burst. They are exposed to the enemy's artillery fire just as much as on land. Their use on the high seas will, therefore, be always very limited, and successful only in favourable, calm, and clear weather.

Dirigible airships may become of much greater use as soon as we succeed in raising still more their speed and radius of action. It is as yet impossible to take them to the high seas as matters now stand—at least not in the way it must be done on active service. No attempts at all have been made to make them rise from, and land again on, warships; nor does it seem at all feasible. But they may find accommodation on their own vessels, these being taken in tow of larger ships, and only rise when on the high seas. There are also grave objections to this, quite apart from the fact that for each large balloon a special transport ship must be made available. Owing to the strong pressure the filled airship would be exposed to, as a rule, when in tow, the gas might escape from the cover, or the cover itself may burst. Landing on board ship after flight would probably also be very difficult. But it may, on the other hand, be feasible to bring the balloon to large ships, with the object of refilling it with gas. Under these circumstances, and owing to the airships being so much dependent on the weather, it will be hardly worth while to take them along to the high seas in this troublesome fashion. It will be preferable to let them gain the high sea from the land, and to make them as much as possible independent of the ships.

The same difficulties as on land will be encountered when we use the dirigibles on the sea in attack and for bombarding. If the airships can be made to suit these purposes, they may render good service to the fleets. But it must be left an open question whether we shall succeed in bombarding with explosives from the airship individual ships while steaming. A hostile squadron in attack formation is, however, such a large target, that a bombardment from the air may be very effective.

In addition to the captive and dirigible balloons, the flying machines will also have to be considered in naval warfare, because on land they play an important rôle, and will no doubt in future be able to intervene effectively in operations by sea as well.

The activity of flying machines from the coast will probably be restricted to reconnoitring to a likely distance of about a hundred kilometres from the land. Their construction has certainly not far enough advanced yet for such a service to work safely and regularly. As a last resource, in fine weather, we shall probably be able to use the flying machines to-day. But whether they can be of service with a high-sea fleet as well, will depend on whether we succeed in designing machines that can start from ships and return again to them. Those flying machines which can rise without preparing for a start, would be theoretically the best to rise from ships. But until we have machines of this type, we cannot escape providing ships with special appliances or arrangements to make it possible for kites to rise from, and land again on, ships. It will therefore depend on the development of present-day mechanics how far the navy can take advantage of flying machines. But we may expect mechanics to solve the questions set here at no distant date. Experiments have repeatedly been made in this direction, auguring well for the future.

America seems specially bent upon solving these problems. Successful experiments have been made there in particular for making flying machines rise from, and land on, ships provided with special arrangements on deck. In the spring of 1911 the Atlantic Fleet carried out an extensive artillery practice, with the express purpose of gaining experience in fighting balloons and flying machines with the ordinary naval artillery, and with guns specially designed for that purpose. America had, moreover, already in 1908, laid down in a striking manner the requirements to be fulfilled by a flying machine for use on active service. Nobody has certainly succeeded yet in fulfilling them. But it is necessary for Germany to make every effort to gain a start on the other Powers in this branch, and at any rate to take care—at least for the present—that the necessary flying machines are available at the outbreak of war for protecting her naval centres and the commercial ports against hostile aircraft, for a desperate fight will ensue not only *below* the waves, but also above them in the clouds.

Besides the actual warships belonging to the fleet, and all the adjuncts which are meant to facilitate and augment its use, so-called auxiliary cruisers are employed in modern war as well—not for real battle, but for injuring hostile trade and threatening extensive lines of operation of the enemy. These are the largest and fastest steamers of the merchant fleets, which, owing to their great coal-carrying capacity, and consequent great radius of action, will be armed for war and turned into auxiliary warships. This procedure was expressly sanctioned in 1907 by the Hague Convention, signed by almost all the States attending the Conference, permitting merchantmen to be turned into men-of-war. War upon the enemy's trade is permissible by international law, and generally customary. This is only natural, and is justified, since war is to-day no longer an affair between cabinets, but between nations. The maritime law in force, however, is very uncertain and undecided.

The only fundamental principle of maritime law recognized by most States, is the Paris Declaration of 1856, which distinctly recognizes the right of capture of all hostile private property except when carried under a neutral flag, and only lays down that this right must not be exercised by privateers (*La course est et demeure abolie*). The auxiliary cruisers have taken the place of privateers, having therefore, like all other warships, the right to capture hostile merchant ships. The Paris Declaration further stipulates that blockades must be effective, without stating what is meant by "effective," and declares the right of contraband of war to continue as before. This right consists in each belligerent deciding, at his own discretion, what he considers to be contraband, thus giving him also the right of confiscating contraband on *neutral* ships. The very fact that this arbitrary regulation exists, and that the right of belligerents is in no way definitely limited with regard to neutrals, makes the maritime law so uncertain. National prize-courts decide, as a rule, on the legality of a prize—*i.e.*, of the capture of a neutral ship—these courts affording, of course, no security whatever for the rights of neutrals.

This state of affairs has caused proposals to be made from various quarters for more definite regulations in maritime law. In 1899 the Geneva Convention was extended to naval warfare. In 1907 a series of conventions were drawn up in the Hague and were ratified by a large number of States, which, however, did not touch upon the most important questions of maritime law concerning contraband and blockade, but only stipulated for a few less important points—namely, transformation of merchant ships into men-of-war, restriction of the use of mines in the interests of peaceful navigation, restriction of the right of bombarding open towns by naval forces, etc. On October 18, 1907, it was further agreed by a special convention to establish an international supreme prize court, affording the guarantee of an impartial judgment concerning prizes. No State, however, has as yet ratified this convention. England, Russia, and Japan, above all, have not signed it. England in particular objected to the legal principles that were to guide the court as a last recourse: *les principes généraux de la justice et de l'équité.* Justice and equity—England could not agree to that, and therefore urged the recent convocation of a naval conference to revise and reform the maritime law.

The conference has agreed upon a number of points representing a real codification of the right of blockade and contraband. It has, further, laid down rules concerning the illegal support given to a belligerent party by neutrals; the destruction of neutral prizes, which is to be permissible if the taking into port of the confiscated ship exposes the capturing warship to danger, or would hamper it in the execution of its particular duties; the changing of the flag by a ship so as to lose her quality as a hostile ship; the convoying of neutral ships by warships; the hostile character of a ship; resistance to being searched, and damages.

No agreement was come to on the legality of transforming a merchant ship into a warship, and on the question whether nationality or residence of the owner is to decide whether the ship or her cargo are hostile property, because the English and Continental interests were absolutely antagonistic.

The regulations concerning blockade and contraband are, above all, important for the conduct of war. They directly and materially influence the means used in naval warfare.

With reference to blockade it has been ruled that only a hostile coast or one occupied by the enemy can be blockaded, and that blockading ships are not allowed to close the approach to neutral ports and coasts. The conference has further stipulated that a blockade is only considered effective if declared in all formality and maintained by a force sufficiently strong to prevent the hostile coast being actually approached. Confiscation of neutral ships is, moreover, allowed only within the radius of action of the warships, and not at all if the ship is making for a port not blockaded. The remainder of the regulations concern details and formal questions.

Regarding contraband, a distinction is made between absolute and relative contraband. To the former belong all objects directly necessary in naval warfare, and to the latter such as would indirectly benefit the conduct of the war, like provisions, clothing, precious metals, and paper money.

There is, besides, drawn up a so-called free list of objects which must never be treated as contraband, while the list of absolute and relative contraband can, under certain conditions, be supplemented by the belligerents. The free list also comprises, in addition to numerous other categories of merchandise which have nothing whatever to do with war, raw materials of the textile and metal industries, thus protecting the industry of the belligerent powers.

The difference in treatment of absolute and relative contraband is chiefly the following: the objects of absolute contraband are liable to confiscation if their destination is the hostile *country*, or a country occupied by the enemy or the hostile *forces*, without regard as to whether this destination is reached directly or perhaps through some neutral territory ; but relative contraband is only liable to confiscation if it is proved that it is meant for *the use of the hostile forces*, or of the *administrative authorities of the hostile State.* The importance of these stipulations is of a far-reaching character. The consequence would be, for instance, that neutral ships could, during the whole war, continue unhampered providing the English people with provisions and the English industry with raw materials.

These regulations are embodied in the so-called London Declaration of February 26, 1909, which has been signed by Germany, France, Russia, Austria, Italy, Spain, Holland, Japan, America, and England. But this Declaration has not been ratified hitherto, just as little as has been the agreement on the International Supreme Prize Court, and we must hope that both conventions will not become part of international law in the future either.

These rules have been adopted in the interest of neutrals, and of neutral trade which naturally strives to prevent the profitable commercial intercourse with the belligerents from being tied up. But Germany would be deprived of one of the most important weapons she could wield in a war with England—namely, relentlessly damaging English imports. England is absolutely dependent on foreign countries for the support of her population. If the import of provisions is cut off, or even considerably restricted only, the Island Kingdom would suffer the most terrible starvation. English industry needs import of raw material as well. If that is restricted there would be no work. Germany would naturally have also the advantage, if these international conventions were universally recognized, of being able to obtain from neutral ships provisions and raw material, which she also needs for the support of her population and maintenance of her industry. But there is a tremendous difference between England and Germany. Firstly, Germany is not, like England, restricted to obtaining those goods by sea alone. Germany can get them, after all, by land as well, and therefore does not need the neutral ships so much as England. But, secondly, England can blockade the German coasts, and thus bring to nought all the advantages Germany could derive from those regulations, while she could, of course, never dream of blockading English ports. The conventions referred to are, therefore, all to the advantage of England. For the rest, they are also in contradiction to the nature of modern war, which, as we have mentioned before, is waged between *peoples*, and must, therefore, also leave the right of injuring the hostile people as a whole. Neutral commerce may meanwhile try other outlets. To buy cheaply and to sell dearly is not the only or even the decisive aim and object of the life of a nation.

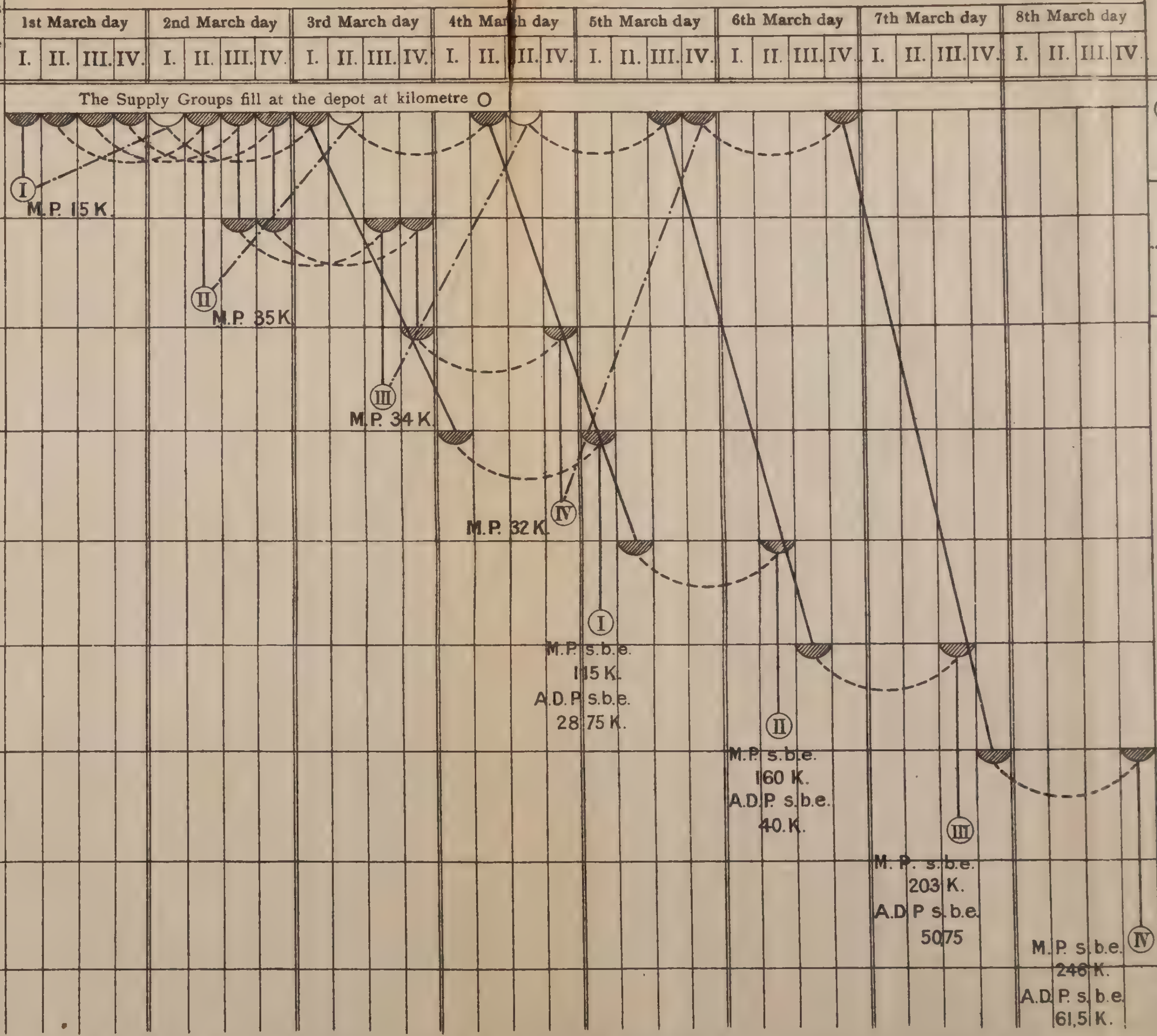
It is seen, therefore, that indirect warfare, especially for Germany, as a supplement to her direct warfare, may become of the greatest importance for the whole issue of the war. Germany must, therefore, never, never allow her right of capture and contraband to be curtailed in opposition to England. These rights, with Germany's great and efficient merchant fleet, are rather one of her best military weapons; with ceaseless energy she must try to prepare for mercantile warfare, and obtain for such in foreign countries pivots, coaling stations, and naval ports.

It was chiefly owing to the fact of being then shut off from all intercourse abroad, and deprived of all imports, that the Southern States of North America succumbed in the war against the Union.

HUGH REES, LTD., LONDON AND CAMBERLEY

The A.C. reaches on the March day	with the head	with the tail	Supply wagons are to receive		Greatest march performance of the supply wagons of the fighting troops	
	of the fighting troops.		from the supply group.	at km.○	when they return to the troops filled.	when they stay over-night at the place of refilling.
				○	km.	km.
1	22	11	I.	15	36	29
Night rest at kilometre 22						
2	44	33	II.	35	40	38
Night rest at kilometre 44						
3	66	51	III.	56	42	41
Night rest at kilometre 66						
4	88	72	IV.	76	46	44
Night rest at kilometre 88						
5	110	97	I.	100	42	44
Night rest at kilometre 110						
6	132	120	II.	125	36	39
Night rest at kilometre 132						
7	154	140	III.	147	36	36
Night rest at kilometre 154						
8	176	164	IV.	170	34	35
Night rest at kilometre 176						
				*Distance from the magazine.		

MOVEMENT OF THE SUPPLY GROUPS.


1st March day
2nd March day
3rd March day
4th March day
5th March day
6th March day
7th March day
8th March day
I. II. III. IV.
The Supply Groups fill at the depot at kilometre ○
Ⓘ M.P. 15 K.
Ⓘ M.P. 35 K.
Ⓘ M.P. 34 K.
Ⓘ M.P. 32 K.
Ⓘ M.P. s.b.e. 115 K. A.D.P. s.b.e. 28.75 K.
Ⓘ M.P. s.b.e. 160 K. A.D.P. s.b.e. 40 K.
Ⓘ M.P. s.b.e. 203 K. A.D.P. s.b.e. 50.75
Ⓘ M.P. s.b.e. 246 K. A.D.P. s.b.e. 61,5 K.

REMARKS.

○ Unloading of the Day-group.

—— March of the filled Day-group.

-·-·- March of the empty Day-group.

- - - Stoppage of the Day-group for refilling at the depot, or night rest of the filled column.

M.P. March performance.

A.D.P. Average daily performance.

s.b.e. Since being emptied

The period from the departure of the empty Day-group from the troops to the depot and back again to the troops comprises always 4 days of march.

A V^th Day-group is assumed to exist, but is not accounted for because it is wanted for supplying the columns themselves.

◒ Filled	Columns.
◡ Empty	

NOTE.—If the four supply-groups are filled and available on the 1st day of march, as assumed here, groups 2, 3, and 4 can of course follow more rapidly than indicated by the above table; *e.g.* group 2 on the 1st day of march to kilometre 10, group 8 on the 2nd day of march to kilometre 30, etc. The last march to the place of issue will then be shortened so that the column can immediately after issue start on its return to the expense magazine. The efficiency in supplying can thus be somewhat increased. But it was not found advisable to allow for this mode of procedure, as it cannot be assumed as a rule that all columns are ready to start at the beginning of the march. They will rather be in most cases on the road the corps was hitherto marching by since the preceding period of operations, and will only by degrees arrive at the depot.

E.M.	Expense Magazine.
P.o.I.	Place of issue, from the echelon to the supply wagons.
S.W.	Supply wagons
S.E.I. **S.E. II.**	Supply echelon { I. Corps. II. Corps.
▨	I. Corps.
▭	II. Corps.
▥	Echelon of I. Corps.
▭	Echelon of II. Corps
M.D.	March Day.

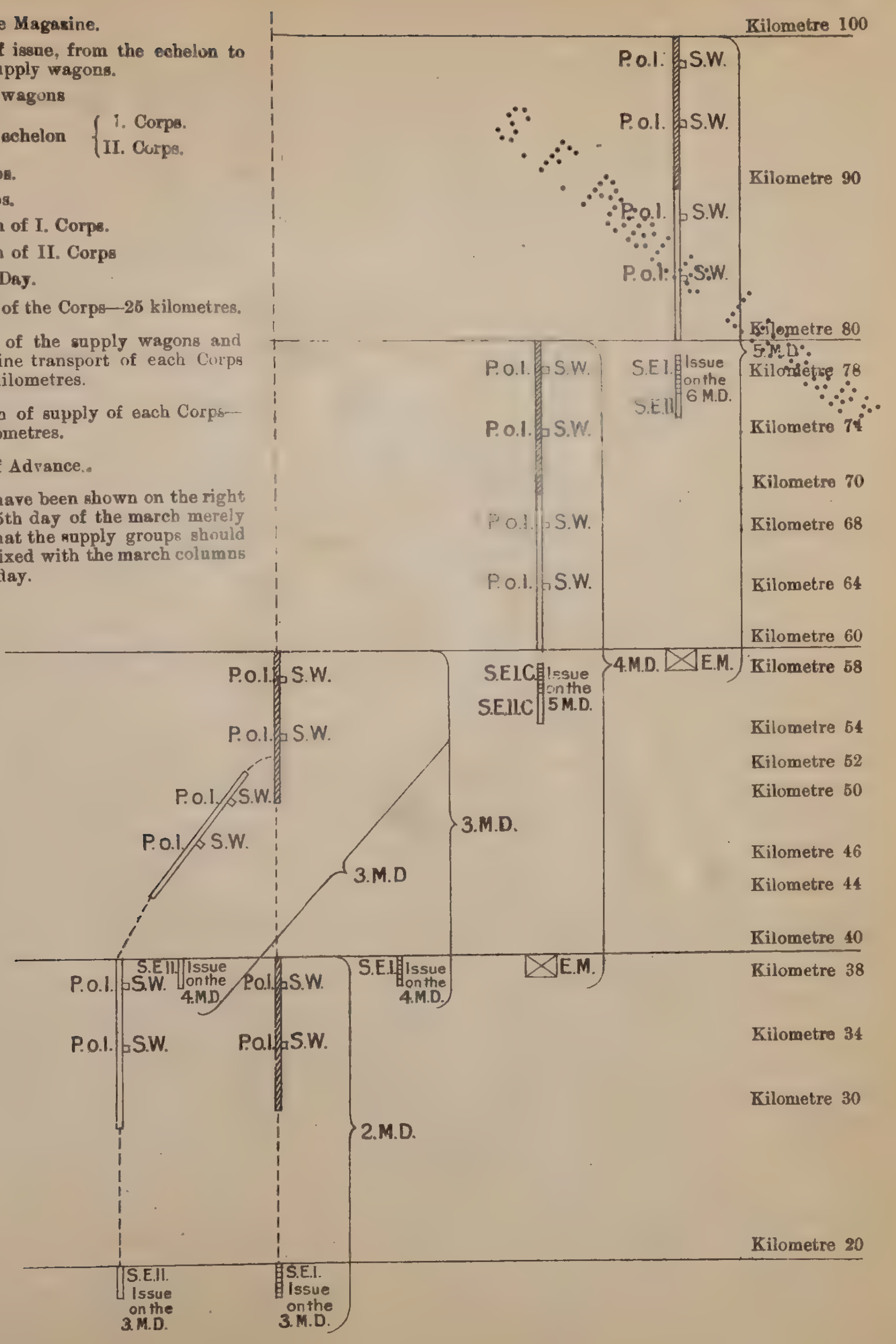
Length of the Corps—25 kilometres.

Length of the supply wagons and 2nd line transport of each Corps—8 kilometres.

Echelon of supply of each Corps—2 kilometres.

— — — — Line of Advance.

The Corps have been shown on the right on the 4th and 5th day of the march merely for the reason that the supply groups should not be shown mixed with the march columns of the previous day.



Appendix IV.

3rd DAY OF MARCH.

TROOPS.

I. Corps	Head at kilom. 40	dep.	5^{0} a.m.
	Head ,, ,, 60	ar.	10^{0} a.m.
	Tail ,, ,, 30	dep.	8^{45} a.m.
	Tail ,, ,, 50	ar.	1^{45} p.m.
II. Corps	Head at kilom. 40	dep.	5^{0} a.m.
	Head ,, ,, 52 (about 14 kilom. march)	ar.	8^{30} a.m
	Tail ,, ,, 29	dep.	8^{30} a.m.
	Tail ,, ,, 44 (about 15 kilom. march)	ar.	12^{15} p m.

2nd LINE TRANSPORT.

I Corps	Head at kilom. 38 (1 kilom. distance from the troops)	dep.	11^{0} a m.
	Head at kilom. 60	ar.	4^{30} p.m.
	Tail ,, ,, 38	dep.	1^{0} p m.
	Tail ,, ,, 50	ar.	4^{0} p.m.
II. Corps	Head at kilom. 38 (1 kilom. distance from the troops)	dep.	11^{0} a.m.
	Head at kilom. 52 (about 16 kilom. march)	ar.	3^{0} p.m.
	Tail ,, ,, 38	dep.	1^{0} p.m.
	Tail ,, ,, 44 (about 7 kilom. march)	ar.	2^{45} p.m.

SUPPLY ECHELON.

I. Corps	Head at kilom. 38 (1 kilom. distance from 2nd line transport)	dep.	1^{15} p.m.
	Head at kilom. 58	ar.	6^{15} p.m.
	Tail ,, ,, 38	dep.	1^{45} p.m.
	Tail ,, ,, 54	ar.	5^{45} p.m.
II. Corps	Head at kilom. 38 (1 kilom. distance from 2nd line transport)	dep.	1^{15} p.m.
	Head at kilom. 50 (about 15 kilom. march)	ar.	5^{0} p.m.
	Tail ,, ,, 38	dep.	1^{45} p.m.
	Tail ,, ,, 46 (about 10 kilom. march)	ar.	4^{15} p.m.

GREATEST DISTANCE COVERED BY THE SUPPLY ECHELON 38 KILOMETRES.

4th DAY OF MARCH.

TROOPS.

I. Corps	Head at kilom. 60	dep.	5^{0} a.m.
	Head ,, ,, 80	ar.	10^{0} a.m.
	Tail ,, ,, 50	dep.	8^{45} a.m.
	Tail ,, ,, 70	ar.	1^{45} p.m.
II. Corps	Head at kilom. 52	dep.	9^{15} a.m.
	Head ,, ,, 70 (about 19 kilom march)	ar.	2^{0} p.m.
	Tail ,, ,, 44	dep.	1^{0} p.m.
	Tail ,, ,, 60 (about 19 kilom. march)	arr.	5^{45} p.m.

2nd LINE TRANSPORT.

I. Corps	Head at kilom. 58 (2 kilom. distance from the troops)	dep.	5^{45} p.m.
	Head at kilom. 80	ar.	11^{15} p.m.
	Tail ,, ,, 58	dep.	7^{45} p.m.
	Tail ,, ,, 70	ar.	10^{45} p.m.
II. Corps	Head at kilom. 50 (about 19 kilom. march)	dep.	3^{0} p.m.
	Head ,, ,, 68	ar.	10^{15} p.m.
	Tail ,, ,, 50	dep.	7^{30} p.m.
	Tail ,, ,, 60 (about 11 kilom. march)	ar.	10^{15} p.m.

SUPPLY ECHELON.

I. Corps	Head at kilom. 58 (1 kilom. distance from 2nd line transport)	dep.	9^{45} p.m.
	Head at kilom. 78	ar.	2^{45} a.m. on the next day.
	Tail ,, ,, 58	dep.	10^{15} p.m
	Tail ,, ,, 74	ar.	2^{15} a m. on the next day.
II. Corps	Head at kilom. 58	dep.	10^{15} p.m.
	Head ,, ,, 68	ar.	12^{45} a.m on the next day.
	Tail ,, ,, 58	dep.	10^{15} p.m.
	Tail ,, ,, 64	ar.	11^{45} p.m.

GREATEST DISTANCE COVERED BY THE SUPPLY ECHELON 38 KILOMETRES.

5th DAY OF MARCH.

TROOPS.

I. Corps	Head at kilom. 80	dep.	5^{0} a.m.
	Head ,, ,, 100	ar.	10^{0} a.m.
	Tail ,, ,, 70	dep.	8^{45} a.m.
	Tail ,, ,, 90	ar.	1^{45} p.m.
II. Corps	Head at kilom. 70	dep.	9^{0} a.m.
	Head ,, , 90	ar.	2^{0} p.m.
	Tail ,, ,, 60	dep.	12^{45} p.m.
	Tail ,, ,, 80	ar.	5^{45} p.m.

2nd LINE TRANSPORT.

I Corps	Head at kilom. 78 (2 kilom. distance from the troops)	dep.	5^{45} p.m.
	Head at kilom. 100	ar.	11^{15} p m.
	Tail ,, ,, 78	dep.	7^{45} p.m.
	Tail ,, ,, 90	ar.	10^{45} p.m.
II. Corps	Head at kilom. 78	dep.	7^{45} p m.
	Head ,, , 90	ar.	10^{45} p.m.
	Tail ,, ,, 78	dep	9^{45} p.m.
	Tail ,, ,, 80	ar.	10^{15} p.m.

SUPPLY ECHELON.

I. Corps	Head at kilom. 78 (1 kilom. distance from the 2nd line transport)	dep.	10^{0} p.m.
	Head at kilom. 98	ar.	8^{30} a.m. on the next day.
	Tail ,, , 78	dep.	10^{30} p.m.
	Tail ,, ,, 94	ar.	12^{30} a m. on the next day
II. Corps	Head at kilom. 78	dep.	10^{30} p.m.
	Head ,, ,, 88	ar.	1^{0} a.m. on the next day.
	Tail ,, ,, 78	dep.	11^{0} p.m.
	Tail ,, ,, 84	ar.	12^{30} a.m. on the next day.

GREATEST DISTANCE COVERED BY THE SUPPLY ECHELON 39 KILOMETRES.